POORNIMA
COLLEGE OF ENGINEERING

INSTITUTE VISION & MISSION

VISION

To create knowledge based society with scientific temper, team spirit and dignity of labor to face the global competitive challenges

MISSION

To evolve and develop skill based systems for effective delivery of knowledge so as to equip young professionals with dedication & commitment to excellence in all spheres of life

POORNIMA
COLLEGE OF ENGINEERING

DEPARTMENT VISION & MISSION

VISION

Evolve as a centre of excellence with wider recognition and to adapt the rapid innovation in Computer Engineering.

MISSION

1) To provide a learning-centered environment that will enable students and faculty members to achieve their goals empowering them to compete globally for the most desirable careers in academia and industry.
2) To contribute significantly to the research and the discovery of new arenas of knowledge and methods in the rapid developing field of Computer Engineering.
3) To support society through participation and transfer of advanced technology from one sector to another.

PROGRAM EDUCATIONAL OBJECTIVES (PEO'S)

PEO1: Graduates will work productively as skillful engineers playing the leading roles in multifaceted teams

PEO2: Graduates will identify the solutions for challenging issues inspiring the upcoming generations leading them towards innovative, creative, and sophisticated technologies.

PEO3: Graduates will implement their pioneering ideas practically to create products and the feasible solutions of research oriented problems

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COLLEGE OF ENGINEERING

PROGRAM OUTCOMES (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals,and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: The ability to understand and apply knowledge of mathematics, system analysis & design, Data Modelling, Cloud Technology, and latest tools to develop computer based solutions in the areas of system software, Multimedia, Web Applications, Big data analytics, IOT, Business Intelligence and Networking systems.

PSO2: The ability to understand the evolutionary changes in computing, apply standards and ethical practices in project development using latest tools & Technologies to solve societal problems and meet the challenges of the future.

PSO3: The ability to employ modern computing tools and platforms to be an entrepreneur, lifelong learning and higher studies.

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COLLEGE OF ENGINEERING

MAPPING OF KEY PHRASES OF THE INSTITUTES MISSION STATEMENT WITH THE KEY PHRASES OF INSTITUTES VISION STATEMENT

(Institution Mission Vs Institute Vision)

Key Phrases of the Mission Statement of the Institute	Key Phrases of the Vision Statement of the Institute		
	To create knowledge based society with scientific temper	Team spirit	To face the global competitive challenges
Skill based systems for effective delivery of knowledge	3		3
To equip young professionals with dedication		1	3
Excellence in all spheres of life	2		2

MAPPING OF KEY PHRASES OF THE DEPARTMENTSVISION STATEMENT WITH THE KEY PHRASES OF INSTITUTES MISSION STATEMENT

(Department Vision Vs Institution Mission)

Key Phrases of the Vision Statement of the Department	Key Phrases of the Mission Statement of the Institute		
	Skill Based Systems	Delivery of Knowledge	Excellence in all spheres of life
Centre of Excellence	3	2	1
Wider recognition	2	2	1
Rapid innovation.	2	1	

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COLLEGE OF ENGINEERING

MAPPING OF KEY PHRASES OF THE DEPARTMENTS MISSION STATEMENT WITH THE KEY PHRASES OF DEPARTMENTS VISION STATEMENT
(Department Mission Vs Department Vision)

Key Phrases of the Mission Statement of the Department	Key Phrases of the Vision Statement of the Department		
	Centre of Excellence	Wider recognition	Rapid innovation.
Learning-centered environment	3		2
Research and Discovery	2		2
Social Responsibility	1	2	1

MAPPING OF KEY PHRASES PEOS WITH KEY PHRASES OF DEPARTMENTS MISSION STATEMENT
(PEO Vs Department Mission)

Key Phrases of PEO Statements	Key Phrases of the Mission of the Department		
	Learning-centered environment	Research and Discovery	Social Responsibility
Skillful engineers	3	2	
Innovative, Creative, and Sophisticated Technologies	3		1
Pioneering Ideas	2	2	

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COLLEGE OF ENGINEERING

MAPPING OF KEY PHRASES OF PSO WITH KEY PHRASES OF DEPARTMENTS MISSION STATEMENT

(PSO Vs Department Mission)

Key Phrases of PSO Statement	Key Phrases of the Mission Department		
	Learning-centred environment	Research and Discovery	Social Responsibility
Technical Knowledge	3	2	
Standards, Ethic, Tools, Challenges Societal Problems	1	2	2
Entrepreneur, Lifelong Learning and Higher Studies.	2		

MAPPING OF KEY PHRASES OF PSO WITH KEY PHRASES PEO

(PSO Vs PEO)

Key Phrases of the PEO Department	Key Phrases of the PSO Department		
	Technical Knowledge	Standards, Ethic, Tools, Challenges Societal Problems	Entrepreneur, Lifelong Learning and Higher Studies.
Skillful engineers	3	2	2
Innovative, Creative, and Sophisticated Technologies	2	2	2
Pioneering Ideas		1	2

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COLLEGE OF ENGINEERING

MAPPING OF KEY PHRASES OF PEO WITH KEY PHRASES OF PO

(PEO Vs PO)

	Key Phrases of PO Statement											
Key Phrases of PEO Statement	Engineering knowledge:	Problem analysis:	Design/development of solutions:	Conduct investigations of complex problems:	Modern tool usage:	The engineer and society:	Environment and sustainability:	Ethics:	Individual and team work:	Communication:	Project management and finance:	Life-long learning:
Skillful engineers	3	3	3	3	2		1	1	2	2	1	2
Innovative, Creative, and Sophisticated Technologies		3	2	2		1	1	1				
Pioneering Ideas	2	1	1	2	2			1	1	2	1	2

RAJASTHANTECHNICALUNIVERSITY, KOTA

SYLLABUS

1st Year - I Semester: B. Tech.

1FY3-07/2FY3-07: Basic Mechanical Engineering

Credit: 2 Max. Marks: 100

Unit No.	Contents	Hours
I	**Fundamentals:** Introduction to mechanical engineering, concepts of thermal engineering, mechanical machine design, industrial engineering and manufacturing technology. **Steam Boilers, Steam Turbines and Power Plants:** Introduction, classification and types of steam boilers and steam turbines. Introduction and Classification of power plants.	**15**
II	**Pumps and IC Engines**: Applications and working of Reciprocating and Centrifugal pumps. Introduction, Classification of IC Engines, Main Components of IC Engines, Working of IC Engines and its components.	**5**
III	**Refrigeration and Air Conditioning:** Introduction, classification and types of refrigeration systems and air-conditioning. Applications of refrigeration and Air-conditioning.	**5**
IV	**Transmission of Power**: Introduction and types of Belt and Rope Drives, Gears	**5**
V	**Primary Manufacturing Processes:** Metal Casting Process: Introduction to Casting Process, Patterns, Molding, and Furnaces. Metal Forming Processes: Introduction to Forging, Rolling, Extrusion, Drawing. Metal Joining Processes: Introduction to various types of Welding, Gas Cutting, Brazing, and Soldering.	**3**
VI	**Engineering Materials and Heat Treatment of Steel:** Introduction to various engineering materials and their properties.	**2**
	Total	**30**

POORNIMA
COLLEGE OF ENGINEERING

DEPARTMENT OF MECHANICAL ENGINEERING

Course Outcomes

Look for strong mapping of course with specific PO (2-3). Define Generic Course Outcomes (max 4 to 6) using Blooms Taxonomy. (In case of Lab Course define generic Lab Outcomes LO and refer CO as LO in thisdocument).

i.	**1FY3/2FY3-7(CO1)**	Students will be able to retrieve basic concepts of thermal and manufacturing process. **(Recall/Remembering)**
ii.	**1FY3/2FY3-7(CO2)**	Students will able to compare different types of thermal and manufacturing processes and. **(Understand)**
iii.	**1FY3/2FY3-7(CO3)**	Students will able to annotating about the functioning of turbine & pumps, IC engines, refrigeration system, modes of transmission of power, materials and primary manufacturing process. **(Apply)**
iv.	**1FY3/2FY3-7(CO4)**	Student will be able to appraise the fundamental knowledge of thermal engineering, in addition to understanding of power transmission to solve the industrial and societal issues. **(Examine)**

CO-PO-PSO Mapping: Mapping Levels: 1- Low, 2- Moderate, 3-Strong

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-

7 PO Strongly Mapped:

PO1:- Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

7.1 PO Moderately Mapped:

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

7.2 PO Low Mapped:

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

7.3 PSO Strongly Mapped:

NIL

7.4 PSO Moderately Mapped:

PSO1:-Design, analyze and innovate solutions to technical issues in Thermal, Production and Design Engineering.
PSO2:- Exhibit the knowledge and skills in the field of Mechanical& Allied engineering concepts

7.5 PSO Low Mapped:

PSO1:-Design, analyze and innovate solutions to technical issues in Thermal, Production and Design Engineering.
PSO3:- Apply the knowledge of skills in HVAC&R and Automobile engineering

Rules for CO/LO Attainment Levels:(Targets)

All the courses of your department should be divided into three categories
A-Most Difficult course,
B-Medium level of Difficulty,
C- Low level of Difficulty –(Easy)
According to difficulty level, you can decide specific range for CO attainment targets for Continuous assessment from the following table.
Remember that targets for internal assessment should be higher.

S. No	Tool	Attainment	
1	**Mid Term Examinations**	**B**	Attainment Level 1: 40-50-% students scoring more than target 65% of marks Attainment Level 2: 50–60 % students scoring more than target 65% of marks Attainment Level 3: 60 % students scoring more than target 65% of marks
2	**RTU Examinations**	**B**	Attainment Level 1: 35-45--% students scoring more than target 60 % of marks Attainment Level 2: 45–55 % students scoring more than target 60% of marks Attainment Level 3: 55 % students scoring more than target 60% of marks
3	**Tutorial / Assignment**	**B**	Attainment Level 1: 40-50-% students scoring more than target 65% of marks Attainment Level 2: 50–60 % students scoring more than target 65% of marks Attainment Level 3: 60 % students scoring more than target 65% of marks

5	**Survey and Feedback**	**B**	Attainment Level 1: 40-50-% students scoring more than target 70% of marks Attainment Level 2: 50–60 % students scoring more than target 70% of marks Attainment Level 3: 60 % students scoring more than target 70% of marks

For the specific CO/LO attainment levels of your respective course please use the above tables as reference according your subject difficulty level and prepare following table.

S. No.	Course Type	Attainment Level=1	Attainment Level=2	Attainment Level=3
1	**Theory Courses** Mid Semester Exams	40-50-% students scoring more than target 65% of marks	Attainment Level 2: 50–60 % students scoring more than target 65% of marks	Attainment Level 3: 60 % students scoring more than target 65% of marks
2	**TheoryCourses** UniversityExam	Attainment Level 1: 35-45--% students scoring more than target 60 % of marks	Attainment Level 2: 45–55 % students scoring more than target 60% of marks	Attainment Level 3: 55 % students scoring more than target 60% of marks
6	**Assignments/Unit Test/ Tutorials**	Attainment Level 1: 40-50-% students scoring more than target 65% of marks	Attainment Level 2: 50–60 % students scoring more than target 65% of marks	Attainment Level 3: 60 % students scoring more than target 65% of marks
7	Any other			

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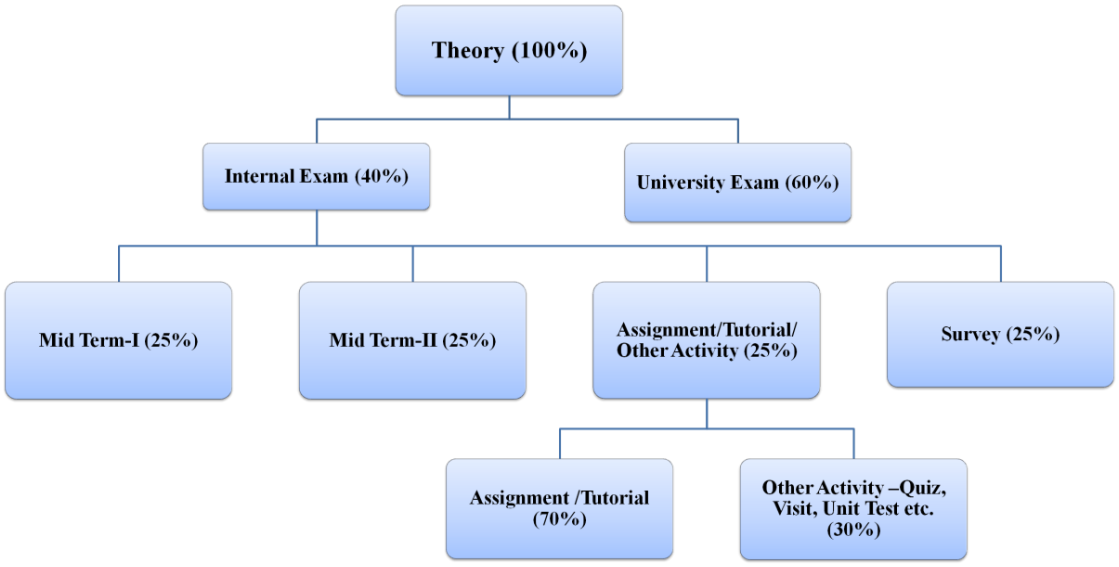
CO wise Assessment Activities (as Mentioned In Session Plan):

Attainment of Course Outcomes

List of assessment processes for the evaluation of CO attainment

Course Type	Processes (Tools)	CO / LO	Assessment Frequency	Facilitator
Theory	Tutorial/Assignment/ Quiz	CO	As per the course requirement	Course Coordinator
	Mid Team	CO	**Mid Term-I:** In the middle of the semester (60% course coverage) **Mid Term-II:** At the end of semester (40% course coverage)	Exam Cell
	Survey	CO	Once: End of semester	Course Coordinator
	University exams	CO	Once: End of semester	Rajasthan Technical University

Detail assessment processes for each category course has been elaborated considering maximum marks 100 as described below:-



Theory assessment process for the evaluation of CO attainment

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Course Outcome Attainment Process:

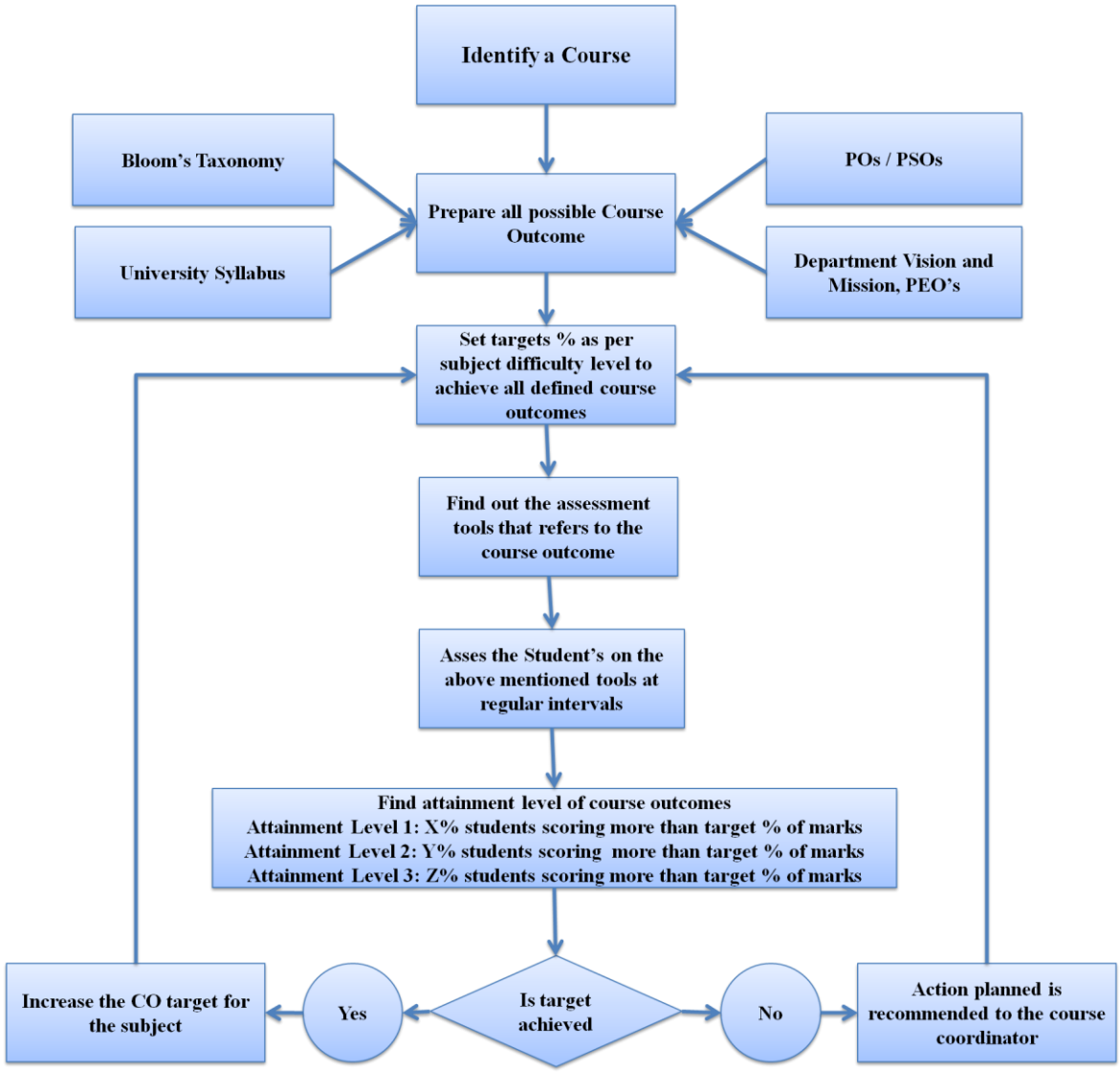

Figure Course Outcome attainment Process

You can plan for each CO, activities/ assessment tools to be conducted/ used for its achievement. Use X to those you select for specific CO. Remove all unused columns.

	Activities				
CO	Assignment1	Quiz/OBT-1	Mid 1	Assignment 2	Mid 2
CO1	X	X	X	X	X
CO2	X	X	X	X	X
CO3	X	X	X	X	X
CO4	X	X	X		X

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COLLEGE OF ENGINEERING

CO wise Assessment Activities:

Based on CO-PO mapping, determine targets for each CO as average of targets of all relevant POs.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	Target CO for PO	PSO1	PSO2	PSO3	Target CO for PSO
CO1	1	-	-	-	-	-	-	-	-	-	-	-	1.00	1	-	-	1.00
CO2	2	-	-	-	-	-	-	-	-	-	-	-	2.00	2	-	-	2.00
CO3	3	-	-	-	-	-	-	-	-	-	-	-	3.00	2	-	-	2.00
CO4	-	1	-	-	-	-	-	-	-	-	-	-	1	-	2	1	1.50
Target PO/PSO through CO	2.00	1											1.75	1.67	2.00	1.00	1.5

Activity wise Assessment Tools:

This gives you generalized view of different direct and indirect tools those can be used for assessment / achievement of CO/PO. (Decide Which tools are required for assessing a particular CO/LO and in reference to Course A, B, C difficulty level).

Sr. No.	Activity	Assessment Method	Tools	Weightage Marks	Recommendation
	Assignment 1	Direct	Marks	10	For CO
	Assignment 2	Direct	Marks	10	For CO
	OBT-1	Direct	Marks	20	For CO
	Quiz-1	Direct	Marks	8	For CO
	Mid Term 1	Direct	Marks	1.12	For CO
	Mid Term 2	Direct	Marks	8	For CO
Note that for every rubrics you need to decide assessment criteria, range of marks or weightage – above values are indicative					

RAJASTHANTECHNICALUNIVERSITY, KOTA

SYLLABUS

1st Year - I Semester: B. Tech.

1FY3-07/2FY3-07: Basic Mechanical Engineering

ABC analysis (RGB method) of unit & topics

Unit No.	Category A (Hard topics)	Category B (Topics with average hardness level)	Category C (Easy to understand topics)	Preparedness for "A" topics
1	Introduction, classification and types of steam boilers and steam turbines.	Introduction and Classification of power plants.	Introduction to mechanical engineering, concepts of thermal engineering, mechanical machine design, industrial engineering and manufacturing technology	Prepare of boiler diagram on paper for better learning.
2	Main Components of IC Engines, Working of IC Engines and its components	Applications and working of Reciprocating and Centrifugal pumps.	Introduction, Classification of IC Engines	Power point presentation.
3	Types and working of refrigeration systems and air-conditioning.	Applications of refrigeration and Air-conditioning	Introduction and classification of refrigeration systems and air-conditioning	Video lecture.
4	Length of belt	Gear train	Introduction of power transmission devices	By lecture delivered and numerical practice.
5	Metal Forming Processes: Introduction to Forging, Rolling, Extrusion, Drawing	Metal Casting Process: Patterns, Molding, and Furnaces.	Introduction to Casting Process and joining process	Practically showed different steps of manufacturing process in mechanical workshop.
6	Heat treatment process	Properties of Engineering materials	Introduction of engineering materials	By lecture delivered.

DR. ANKIT TYAGI

	1 8:00 - 9:00	2 9:00 - 10:00	3 10:00 - 11:00	4 11:00 - 12:00	Break 12:00 - 12:50	5 12:50 - 13:50	6 13:50 - 14:50
Monday	LT:- 3107 1FY3-07_BME CSE_D			Batch_F3 LB:- 3308 1FY3-29_CAED IT_F	**Break/ Lunch**	IT_F LB:- 3308 1FY3-29_CAED Batch_F3	
Tuesday							LT:- 3107 1FY3-07_BME CSE_D
Wednesday						LT:- 3107 1FY3-07_BME CSE_D	
Thursday	Batch_A3 LB:- 3007 1FY3-29_CAED EC+EE_A			Batch_F1 LB:- 3006 1FY3-29_CAED IT_F		IT_F LB:- 3006 1FY3-29_CAED Batch_F1	
Friday			IT_F LT:- 3211 1FY3-29_CAED Batch_F2			Batch_F2 LT:- 3211 1FY3-29_CAED IT_F	

POORNIMA
COLLEGE OF ENGINEERING

Affiliated to RTU, Kota • Approved by AICTE & UGC under 2(f)

ACADEMIC CALENDAR 2023-24*#

ODD SEMESTER

JULY 2023

RTU THEORY EXAMINATION OF FIRST YEAR [EVEN SEM 2022-23]

AUGUST 2023

Practical Training [After II, IV, VI Sem.]

Monday 15 Celebration of Independence Day.

SEPTEMBER 2023

Monday 11 Commencement of Classes-Odd Semesters B. Tech. III/V/VII Sem.

Wednesday 06 to Sataturday16 Induction Program B.Tech. I Sem

Monday 18 Commencement of Classes-Odd Semesters B. Tech. I Sem.

Tuesday 05 Celebration of Teachers' Day & Activities under WISE

Friday 15 Engineers' Day

Friday 29 Blood Donation Camp

OCTOBER 2023

Monday 02, 2023 Annual Day KALANIDHI' & Faculty Felicitation Program

Monday 16, 2023 Manthan- Inter-college Debate Competition

Wednesday 11, to Friday 13 First Mid Term Theory & Practical Exam for B.Tech VII Sem

Monday 16, to Saturday 21 First Mid Term Theory & Practical Exam for B.Tech V & III Sem

NOVEMBER 2023

Thursday 02, to Wednesday 08 First Mid Term Theory & Practical Exam for B.Tech I Sem

Tuesday 28 to Thursday 30 Second Mid-TermTheory & Practical Exam for B.Tech VII Sem

Thursday 30, 2023 Last Teaching Day for B.Tech VII Sem

Tuesday 28 to Tuesday, Dec. 05 Second Mid Term Theory & Practical Exam for B.Tech V & III Sem

DECEMBER 2023

As Per RTU Exmination Schedule End-Term Practical Exams for B.Tech VII Sem

Tuesday 05 Last Teaching Day for B.Tech V & III Sem

As Per RTU Exmination Schedule End-Term Practical Examination for B.Tech V & III Sem

Monday 18, to Saturday 23 Second Mid-TermTheory & Practical Exam for B.Tech I Sem

Saturday 23 Last Teaching Day for B.Tech I Sem

JANUARY 2023

As Per RTU Exmination Schedule End-Term Practical Examination for B.Tech I Sem

JULY 2023

Sun	Mon	Tue	Wed	Thu	Fri	Sat
30	31					1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

AUGUST 2023

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

SEPTEMBER 2023

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

OCTOBER 2023

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

NOVEMBER 2023

Sun	Mon	Tue	Wed	Thu	Fri	Sat
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

DECEMBER 2023

Sun	Mon	Tue	Wed	Thu	Fri	Sat
31					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

HOLIDAYS IN ODD SEMESTER

- Independence Day Celebration - 14 August, Monday - 15 August, Tuesday
- Raksha Bandhan - 30 August, Wednesday
- Krishna Janmashtami - 7 September, Thursday - 9 September, Saturday
- Vijayadashami - 24 October, Tuesday
- Diwali Break - 10 November, Friday - 14 November, Tuesday
- Gurunanak Jayanti - 25 November, Saturday - 27 November, Monday
- Christmas - 23 December, Saturday - 25 December, Monday
- New Year - 01 January, Monday - 02 January, Tuesday

*Subject to revision as per RTU notifications

#For all Engineering Faculty and Students of PCE

POORNIMA COLLEGE OF ENGINEERING

BLOWN UP

Campus: PCE	**Course: B. Tech**	**Class/Section:**	**Date:**
Name of Faculty:		**Name of Subject: Basic Mechanical Engineering**	**Code: 1F-Y307/2FY3-07**

S.No.	Topic as per Syllabus	BLOWN UP TOPICS (upto 10 Times Syllabus)
	Zero Lecture	
1.	. **1. Fundamentals**	1.1 Introduction to Mechanical Engineering 1.2 Concepts of Thermal Engineering 1.3 Mechanical Machine Design 1.4 Industrial Engineering. 1.5 Manufacturing Technology
2	**2. Steam Boilers, Steam Turbines**	2.1 Introduction 2.2 Formation of Steam 2.3 Fire tube Boilers 2.4 Water tube Boilers 2.5 Difference between Fire tube and Water tube Boiler 2.6 Locomotive Boiler 2.7 Babcock and Wilcox Boiler 2.8 Lamont Boiler 2.9 Benson Boiler 2.10 Advantages of high pressure boiler 2.11 Boilers Mountings and Accessories 2.12 Introduction of Steam Turbine 2.13 Classification Steam Turbine 2.14 Working principal of steam turbine 2.15 Thermodynamic cycle for Steam Turbine 2.16 Simple Impulse Turbine 2.17 Compound Impulse Turbine 2.18 Impulse reaction Turbine 2.19 Comparison of Impulse and Reaction Turbine

3.	**3. Power Plants**	3.1 Introduction of Power Plant 3.2 Classification of Power Plant 3.3 Thermal Power Plant 3.4 Line Diagram and Working of Thermal Power Plant 3.5 Advantages and Disadvantages 3.6 Hydro Power Plant 3.7 Construction and Working of Hydro Power Plant 3.8 Nuclear Power Plant 3.9 Gas Turbine Power Plant 3.10 Diesel Power Plant 3.11 Environment Constraint of power generation 3.12 Solar Power Plant 3.13 Wind Power Plant 3.14 Tidal Power Plant 3.15 Geothermal Power Plant 3.16 Ocean thermal energy conversion (OTEC)
4	**4. Pumps**	4.1 Introduction of pumps 4.2 Reciprocating pumps 4.3 Work done by reciprocating pump 4.4 Centrifugal pump 4.5 Main parts of Centrifugal pump 4.6 Advantages and disadvantages of Centrifugal pump 4.7 Compression between Centrifugal pump and reciprocating pumps
5	**5. IC Engines**	5.1 Introduction 5.2 Classification of IC Engines 5.3 Main Parts of IC Engine 5.4 Engine Power and Efficiency 5.5 Four Stroke Diesel Engine 5.6 Four Stroke Petrol Engine 5.7 Difference between Four Stroke Diesel and Petrol Engine 5.8 Two stroke Diesel Engine 5.9 Two stroke Petrol Engine 5.10 Advantages and Disadvantages of Two Stroke Engine 5.11 Fuel supply system 5.12 Cooling system 5.13 Lubrication system 5.14 Carnot cycle 5.15 Otto cycle 5.16 Diesel cycle 5.17 Dual cycle

6	**6. Refrigeration and Air Conditioning**	6.1 Introduction 6.2 Units of Refrigeration 6.3 Refrigeration Systems 6.4 Reserve Carnot Cycle 6.5 VapourCompression Cycle 6.6 Refrigerants 6.7 Types of Refrigerants 6.8 Air Refrigerants 6.9 Methods of Refrigerants 6.10Application of Vapour Compression Cycle 6.11VapourAbsorption System 6.12Air-conditioning 6.13Application of Air-conditioning 6.14Summer Air-conditioning 6.15Winter Air-conditioning
7.	**7. Transmission of Power**	7.1 Introduction 7.2 Classification of Belts 7.3 Types of belt drive 7.4 Velocity Ratio 7.5 Length of Belt 7.6 Slip and Creep of Belt 7.7 Tension Ratio in Flat Belt 7.8 Initial Tension 7.9 Centrifugal Tension 7.10 Maximum power 7.11 Tension Ratio in V Belt 7.12 Advantages and disadvantages V and flat belt drive 7.13 Classification of Rope Drive 7.14 Tension ratio in Rope Drive 7.15 Introduction to Gears drive 7.16 Application and Classification of Gears 7.17 Gear Terminology 7.18 Advantages and disadvantages of gears drive
8	**8. Metal Casting Process**	8.1 Introduction 8.2 Metal Casting Process 8.3 Types of Casting 8.4 Patterns 8.5 Molding 8.6 Furnaces 8.7 Fettling 8.8 Casting Defects

9.	**9. Metal Forming Processes**	9.1 Introduction 9.2 Forging 9.3 Rolling 9.4 Extrusion 9.5 Drawing
10.	**10. Metal Joining Processes**	10.1 Introduction 10.2 Welding 10.3 Types of Welding 10.4 Arc Welding 10.5 Gas Welding 10.6 Gas Cutting 10.7 Brazing 10.8 Soldering
11.	**11. Engineering Materials**	11.1 Introduction 11.2 Ferrous metal and alloys 11.3 Non Ferrous metals and alloys
12.	**12. Heat Treatment Process**	12.1 Introduction 12.2 Heat Treatment Furnace 12.3 Annealing 12.4 Quenching 12.5 Normalizing 12.6 Hardening 12.7 Tempering 12.8 Carburizing

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

Campus: Poornima College of Engineering	**Class/Section: I Sem**	**D**
Course: B.Tech.	**Year/ Section –I Year**	**2023-24**
Name of Faculty: Dr Ankit Tyagi	**Name of Subject :Basic Mechanical Engineering**	**Code: 1FY3-07**

Textbook: Author- *R. Ravindran*

COURSE Deployment

Lec. No.	TOPIC AS PER BLOWNUP SYLLABUS	Unit NO.	PLANNED DATE	ACTUAL DEL. DATE	TEACHING METHOD	CO	PO	REF. / TEXT BOOK
1	**ZERO LECTURE** **Introduction Fundamentals** Introduction to lecture-1 Introduction to Mechanical Engineering 1.2 Scope of mechanical Engineering 1.3 Mechanical machine design 1.4 Industrial engineering. 1.5 Manufacturing technology --Summary of lecture. --Brief on the next lecture content	L-0 1			PPT Chalk Board	CO-1 CO-2	1	R. Ravindran/AK Rajwanshi
2.								

3.	**Introduction to lecture-** **Concepts of thermal engineering** 1.6 Basic terms in thermodynamics 1.7 Work and Heat **Various thermodynamic process** 1.8Isochoric Process 1.9 Isobaric Process 1.10 Isothermal Process 1.11 Reversible Adiabatic Process 1.12 Thermodynamic equilibrium 1.13 Laws of Thermodynamics --Summary of lecture. --Brief on the next lecture content	1			Chalk Board	CO-1 CO-2 CO-3	1	R. Ravindran/AK Rajwanshi
4.	**Introduction to lecture-** **Steam Boilers** 2 Introduction 3 Formation of Steam 4 Fire tube Boilers 5 Water tube Boilers 6 Difference between Fire tube and Water tube Boiler 7 Locomotive Boiler 8 Babcock and Wilcox Boiler 9 Lamont Boiler 10 Benson Boiler 11 Advantages of high pressure boiler 12 Boilers Mountings and Accessories --Summary of lecture. --Brief on the next lecture content.	1			Chalk Board	CO-1 CO-2 CO-3	1	R. Ravindran/AK Rajwanshi
	Introduction to lecture-							

5.	**Steam Turbines** Introduction of Steam Turbine 13 Classification Steam Turbine 14 Working principal of steam turbine 15 Thermodynamic cycle for Steam Turbine 16 Simple Impulse Turbine 17 Compound Impulse Turbine 18 Impulse reaction Turbine 19 Comparison of Impulse and Reaction Turbine --Summary of lecture. --Brief on the next lecture content.	1			Chalk Board	CO-1 CO-2 CO-3	1	R. Ravindran/AK Rajwanshi
6	**Introduction to lecture-** **Power Plants** 20 Introduction of Power Plant 21 Classification of Power Plant 22 Thermal Power Plant 23 Line Diagram and Working of Thermal Power Plant 24 Advantages and Disadvantages 25 Nuclear Power Plant 26 Gas Turbine Power Plant 27 Diesel Power Plant 28 Solar Power Plan --Summary of lecture. --Brief on the next lecture content.	1			Chalk Board	CO-1 CO-2 CO-3	1	R. Ravindran/AK Rajwanshi
7	**Introduction** **Pumps** Introduction to lecture- 29 Introduction of pumps 30 Reciprocating pumps	2			Chalk Board	CO-1 CO-2 CO-3	1	

	31 Work done by reciprocating pump 32 Centrifugal pump 33 Main parts of Centrifugal pump 34 Advantages and disadvantages of Centrifugal pump 35 Compression between Centrifugal pump and reciprocating pumps --Summary of lecture. --Brief on the next lecture content.						1	R. Ravindran/AK Rajwanshi
8.	**Introduction to lecture-** **IC Engines** 36 Introduction 37 Classification of IC Engines 38 Main Parts of IC Engine 39 Engine Power and Efficiency 40 Four Stroke Diesel Engine 41 Four Stroke Petrol Engine 42 Difference between Four Stroke Diesel and Petrol Engine --Brief on the next lecture content.	2			Chalk Board	CO-1 CO-2 CO-3	1	R. Ravindran/AK Rajwanshi
9	**Introduction to lecture-** 43 Two stroke Diesel Engine 44 Two stroke Petrol Engine 45 Advantages and Disadvantages of Two Stroke Engine 46 Fuel supply system 47 Cooling system 48 Lubrication system Summary of lecture. --Brief on the next lecture content.	2			Chalk Board	CO-2 CO-3 CO-4	1 2	R. Ravindran/AK Rajwanshi

10	**Introduction to lecture-Refrigeration** 49 Introduction 50 Units of Refrigeration 51 Refrigeration Systems 52 Reserve Carnot Cycle 53 VapourCompression Cycle 54 Refrigerants 55 Types of Refrigerants 56 Air Refrigerants 57 Methods of Refrigerants 58 Application of Vapour Compression Cycle --Summary of lecture. --Brief on the next lecture content.	3			Chalk Board	CO-1 CO-2 CO-3	1	R. Ravindran/AK Rajwanshi
11	**Introduction to lecture-Refrigeration and Air Conditioning** 59 Vapour absorption system 60 Air-conditioning 61 Application of Air-conditioning 62 Winter Air-conditioning and Summer Air-conditioning --Summary of lecture.	3			Chalk Board	CO-2 CO-3 CO-4	1, 2	
12	--Brief on the next lecture content. **Quiz/OBT** **Introduction to lecture-**					CO-1 CO-2 CO-3 CO-4	1, 2	R. Ravindran/AK Rajwanshi

13	**Transmission of Power** 63 Introduction 64 Classification of Belts 65 Types of belt drive 66 Velocity Ratio 67 Length of Belt 68 Slip and Creep of Belt 69 Tension Ratio in Flat Belt --Summary of lecture. --Brief on the next lecture content.	4			Chalk Board	CO-1 CO-2 CO-3	1	
14	**Introduction to lecture-** 70 Initial Tension 71 Centrifugal Tension 72 Maximum power 73 Tension Ratio in V Belt 74 Advantages and disadvantages V and flat belt drive 75 Classification of Rope Drive --Summary of lecture. --Brief on the next lecture content.	4			Chalk Board	CO-2 CO-3 CO-4	1, 2	R. Ravindran/AK Rajwanshi
15	**Introduction to lecture-** 76 Tension ratio in Rope Drive 77 Introduction to Gears drive 78 Application and Classification of Gears 79 Gear Terminology 80 Advantages and disadvantages of gears drive Summary of lecture. --Brief on the next lecture content.	4			Chalk Board	CO-1 CO-2 CO-3	1	R. Ravindran/AK Rajwanshi
	Introduction to lecture-				Chalk Board	CO-1 CO-2	1	R. Ravindran/AK Rajwanshi

16	**Metal Casting Process** 81 Introduction 82 Metal Casting Process 83 Types of Casting 84 Patterns 85 --Moulding 86 Furnaces 87 Fettling 88 Casting Defects Summary of lecture. --Brief on the next lecture content.	5				CO-3		
17	**Introduction to lecture-** **Metal Forming Processes** 89 Introduction 90 Forging 91 Rolling 92 Extrusion 93 Drawing Summary of lecture. --Brief on the next lecture content.	5			Chalk Board	CO-1 CO-2 CO-3	1	R. Ravindran/AK Rajwanshi
18	**Introduction to lecture-** 94 Introduction 95 Welding 96 Types of Welding 97 Arc Welding --Summary of lecture. --Brief on the next lecture content.	5			Chalk Board/ Projector	CO-1 CO-2 CO-3	1	R. Ravindran/AK Rajwanshi
19	**Introduction to lecture-** 98 Gas Welding 99 Gas Cutting 100 Brazing 101 Soldering --Summary of lecture. --Brief on the next lecture content.	5			Chalk Board	CO-1 CO-2 CO-3	1	R. Ravindran/AK Rajwanshi
20		6			Chalk Board	CO-1 CO-2 CO-3	1	

21	**Introduction to lecture-** 102 Introduction 103 Ferrous metal and alloys 104 Pig iron 105 Cast iron steels 106 Alloy steel --Summary of lecture. --Brief on the next lecture content.	6			Chalk Board	CO-1 CO-2 CO-3	1	R. Ravindran/AK Rajwanshi
22	**Introduction to lecture-** 107 Non Ferrous metals and alloys 108 Copper 109 Aluminum 110 Zinc 111 Brasses 112 Bronzes ----Summary of lecture. --Brief on the next lecture content.	6			Chalk Board	CO-1 CO-2 CO-3	1	R. Ravindran/AK Rajwanshi
23	**Introduction to lecture-** **Heat Treatment Process** 113 Introduction 114 Heat Treatment Furnace 115 Annealing 116 Quenching. --Summary of lecture. --Brief on the next lecture content.	6			Chalk Board	CO-1 CO-2 CO-3	1	R. Ravindran/AK Rajwanshi
24	**Introduction to lecture-** **Heat Treatment Process** 117 Normalizing 118 Hardening 119 Tempering 120 Carburizing Summary of lecture. --Brief on the next lecture content.	1-3				CO-1 CO-2 CO-3 CO-4	1, 2	R. Ravindran/AK Rajwanshi

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1E3107

Roll No. 22EPCCS198 Total No. of Pages: 2

1E3107

B. Tech. I - Sem. (Main / Back) Exam., - 2023

1FY3 – 07 Basic Mechanical Engineering

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 Describe Law of Thermodynamics?

Q.2 Describe with figure different type of belt drive.

Q.3 Define the coefficient of performance of Refrigerator.

Q.4 What is the pattern in casting process?

Q.5 What is industrial engineering & its scope?

Q.6 Differentiate between water tube and fire tube boiler?

Q.7 Write a short note on different type of power plants.

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Q.8 What is the IP & BP in the Internal Combustion Engine?

Q.9 Describe modern tools used in Mechanical Engineering.

Q.10 Differentiate between impulse and reaction turbine?

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Explain any one type of water tube boiler with neat sketch.

Q.2 Explain differentiate between 2 stroke & 4 stroke engine.

Q.3 How Cavitation can be eliminated by Pump?

Q.4 Describe with figure different types of belt drive?

Q.5 What is air conditioning? Draw and describe different component used in it.

Q.6 Explain the various stages of Heat treatment process?

Q.7 Write short notes on –

(i) Forging

(ii) Drawing

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 What is meant by refrigeration system? Describe vapor compression refrigeration system?

Q.2 What is gear transmission? Describe different types of gear.

Q.3 Describe rolling process with neat sketches.

Q.4 With a suitable sketch explain the working of centrifugal pump.

Q.5 Describe hardening and tempering of steel.

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2E3206

Roll No. 21ESKCA009

2E3206

[Total No. of Pages : 2]

B.Tech. II Sem (Main) Examination, July - 2022
2FY3-07 Basic Mechanical Engineering

Time : 3 Hours **Maximum Marks : 70**

Attempt all Ten questions from Part A, Five questions out of Seven questions from Part B and Three questions out of Five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

Attempt **ALL** questions are compulsory. **(10×2=20)**

1. What is industrial engineering? Write its scope. (2)
2. Explain the adiabatic system with suitable example. (2)
3. Describe Zeroth law of thermodynamics. (2)
4. Define steam boilev and write different types of boiler. (2)
5. Define blade velocity coefficient. (2)
6. Define toughness and brittleness. (2)
7. What do you understand by chamfering and Baring. (2)
8. What is pattern in casting process? (2)
9. What are different types of belt drives? (2)
10. What is the difference between efficiency and Co-efficient of performance. (2)

PART - B

(Analytical/Problem solving questions)

Attempt any **Five** questions: **(5×4=20)**

1. Why cooling of I.C. Engines required? Describe briefly any one cooling method used in I.C. Engines. **(4)**
2. Write short note on comfort air conditioning. **(4)**
3. The distance between two bearing of a shaft which transmits 200 h.p. at 250 rpm is 250 cm. It is subjected to torsion only. Determine the diameter of the shaft for steady loading if the safe shear stress is 400 kg/cm^2. **(4)**
4. Derive an expression for the length of open belt drive. **(4)**
5. Differentiate between welding, braning and soldering processes. **(4)**
6. What is metal casting? Describe different methods of metal casting. **(4)**
7. Explain the various engineering materials properties. **(4)**

PART - C

(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any **Three** *questions:* **(3×10=30)**

1. An engine, based on air standard Otto cycle, is supplied with air at 0.1 Mpa and 35° C. The compression ratio is 8. The heat supplied is 500 KJ/kg. for given working air specific heat capacity at constant pressure and at constant volume is 1.005 KJ/kgk, 0.718 KJ/kgk respectively find the following. **(10)**
   a) Efficiency of an engine
   b) Temperature and pressure at the end of compression
   c) Maximum temperature of the cycle.
2. What is meant by refrigeration system? Describe vapor compression refrigeration system with suitable diagram. **(10)**
3. Explain in detail, the various operations of drilling machine with diagrams. **(10)**
4. Explain the various stages of heat treatment process. **(10)**
5. A belt is running over a pulley of diameter 100 cm at 300 rpm. The angle of contact is 150° and coefficient of friction between the belt and pulley is 0.3. If the maximum tension in the belt is 3000 N, find the power transmitted by the belt. **(10)**

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1E2407

Roll No

Total No of Pages: 2

1E2407

B. Tech. II-Sem. (Back) Exam., Oct.-Nov. - 2020

ESC

2FY3 – 07 Basic Mechanical Engineering

Time: 2 Hours

Maximum Marks: 65
Min. Passing Marks: 23

Instructions to Candidates:

Attempt all five questions from Part A, four questions out of six questions from Part B and one questions out of three from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL

2. NIL

PART – A

(Answer should be given up to 25 words only) **[5×2=10]**

All questions are compulsory

Q.1 Define Zeroth law of thermodynamics.

Q.2 What is priming in pump?

Q.3 Define coefficient of performance of Refrigerator. Also write its expression.

Q.4 What are the differences between Soldering and brazing?

Q.5 Define toughness and brittleness.

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PART – B

(Analytical/Problem solving questions) **[4×10=40]**

Attempt any four questions

Q.1 What do you understand by steam boilers? How they are classified?

Q.2 Describe the four stroke SI engine with the help of PV and TS diagrams.

Q.3 What do you understand by the refrigeration system? Describe the most popular refrigerant cycle used in refrigerators. Explain their components in brief.

Q.4 Describe the different types of the Gear trains with diagram and also derive their expression for speed ratio.

Q.5 Explain the various forging operations with suitable neat diagrams.

Q.6 Explain the various heat treatment methods with the help of suitable diagram.

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[1×15=15]**

Attempt any one questions

Q.1 What is Nuclear power plant? Explain the various components of Nuclear power plant. Describe the working of Nuclear power plant, advantages and disadvantages.

Q.2 An engine, based on air standard otto cycle, is supplied with air at 0.1 MPa and 35°C. The compression ratio is 8. The heat supplied is 500 kJ/kg. For given working air specific heat capacity at constant pressure and at constant volume is 1.005 kJ/kgK, 0.718kJ/kgK respectively, find the following-

(a) Efficiency of an engine

(b) Temperature and pressure at the end of compression

(c) Maximum temperature of the cycle

Q.3 What is Open Belt Drive? Derive the expression for the length of belt of open belt drive.

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Roll No. Total No of Pages: 3

1E2407

B. Tech. II - Sem. (Main) Exam., May - 2019

ESC

2FY3 – 07 Basic Mechanical Engineering

Time: 2 Hours **Maximum Marks: 80**

Instructions to Candidates:

Attempt all five questions from Part A, four questions out of six questions from Part B and two questions out of three from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

(Answer should be given up to 25 words only) **[5×2=10]**

All questions are compulsory

Q.1 Explain the isolated system. [2]

Q.2 What is IP & BP in the Internal Combustion Engine? [2]

Q.3 Define the coefficient of performance of Refrigerator. [2]

Q.4 What is pattern in casting process? [2]

Q.5 What is computer aided manufacturing? [2]

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PART – B

(Analytical/Problem solving questions) **[4×10=40]**

Attempt any four questions

Q.1 Explain the velocity triangle for single stage impulse turbine. [10]

Q.2 Describe the four stroke Spark – Ignition engine with suitable diagram. [10]

Q.3 Define construction & working of vapour compression refrigeration system with diagrams. [10]

Q.4 A belt is a running over a pulley of diameter 100 cm at 300 rpm. The angle of contact is 150° and coefficient of friction between the belt and pulley is 0.3. If the maximum tension in the belt is 3000N, find the power transmitted by the belt. [10]

Q.5 Explain the various operations of drilling machine with diagrams. [10]

Q.6 Explain the various stages of Heat treatment process. [10]

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[2×15=30]**

Attempt any two questions

Q.1 What is Diesel power plant? Explain Operation, Layout, Requirement and advantage and disadvantage of Diesel power plant. [15]

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Q.2 3 kW of power is transmitted by an open belt drive. The linear velocity of the belt is 3 m/s. The angle of lap on the smaller pulley is 150°. The coefficient of friction is 0.3. Determine the effect on power transmission in the following cases – [15]

(a) Initial tension in the belt is increased by 10%.

(b) Initial tension in the belt is decreased by 10%.

(c) Angle of lap is increased by 10% by the use of an idler pulley, for the same speed and the tension on the tight side.

(d) Coefficient of friction is increased by 10% by suitable dressing to the friction surface of the belt.

Q.3 Why testing of an internal combustion engine is required? Explain the various testing parameters briefly. [15]

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1E2407

B. Tech. I - Sem. (Main/Back) Exam., Dec. 2019
1FY1 – 07 Basic Mechanical Engineering

Time: 2 Hours

Maximum Marks: 80
Min. Passing Marks: 28

Instructions to Candidates:

Attempt all five questions from Part A, four questions out of six questions from Part B and two questions out of three from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

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PART – A

(Answer should be given up to 25 words only) **[5×2=10]**

All questions are compulsory

Q.1 Define blade velocity co – efficient.

Q.2 What is the role of moderator in nuclear power plant?

Q.3 Why priming of a pump is required?

Q.4 Describe Zeroth law of thermodynamics.

Q.5 Differentiate between Joule's law and Gay – Lussac's law

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PART – B

(Analytical/Problem solving questions) **[4×10=40]**

Attempt any four questions

Q.1 Write a short note on points given below-

(a) Power output of Parson's reaction turbine.

(b) Velocity diagram of Parson's reaction turbine

(c) Blade efficiency of Parson's reaction turbine.

(d) Stage efficiency of Parson's reaction turbine

(e) Nozzle efficiency of Parson's reaction turbine

Q.2 (a) Discuss various components of nuclear power plant.

(b) Differentiate between coal thermal power plant and Geo thermal power plant in brief.

Q.3 Explain working of a reciprocating pump along with their applications and neat diagram.

Q.4 Describe the following points –

(a) Case hardening

(b) Unit of Refrigeration

(c) Co – efficient of performance

(d) Cast Iron and types

(e) Cutting speed

Q.5 Explain Locomotive Boiler by using following points –

(a) Neat sketch

(b) Working principle

(c) Components / parts & their working

(d) Applications

Q.6 Explain the following processes-

(a) Soaking

(b) Brazing

(c) Soldering

(d) Drilling

(e) Extrusion

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PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[2×15=30]**

Attempt any two questions

Q.1 (a) Describe different types of belt drives.

(b) Derive an expression for the length of open belt drive.

(c) Ice is formed at 0°C from water at 20°C. The temperature of refrigerant is 10°C. Find the Ice formed per kWh. Assume latent heat of Ice is 334 kJ/kg. Assume working in perfect Carnot cycle. http://www.rtuonline.com

Q.2 (a) Explain working of an I.C. Engine with their components.

(b) Derive the formula of mechanical efficiency and indicated power of an I.C. Engine.

Q.3 (a) Describes Electrolux refrigerator with neat sketch.

(b) Two parallel shafts 6m apart are to be connected by a belt running over pulleys of diameter 50 cm and 30 cm respectively. Determine the exact and approximate lengths of belt required.

(i) If the belt is open

(ii) If the belt is crossed

(c) What is centrifugal tension? Derive an expression for the same.

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2E2306

Roll No. ___

Total No of Pages: 3

2E2306

B. Tech. II Sem. (Main) Exam., May – 2018

ME -102 Basic Mechanical Engineering

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 28

Instructions to Candidates:

*Attempt any **five questions** including Question No. 1, which is Compulsory. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

1. NIL

2. NIL

Q.1 Compulsory [8×2=16]

Answers for each sub-question be given 50 words- (each question carry 2 marks)

(a) Describe different modern tools used in mechanical engineering.

(b) Describe law of thermodynamics.

(c) Describe different fields of manufacturing technology.

(d) Differentiate between water tube boiler and fire tube boiler.

(e) Differentiate between impulse and reaction turbine.

(f) Write a short note on different types of power plant.

(g) What is industrial engineering & its scope?

(h) Define steam boiler & write different types of boiler.

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Q.2 (a) Differentiate between 2 stroke & 4 stroke engine. [4]

(b) Describe ideal Otto cycle & derive formula for its efficiency. [4]

(c) Diesel cycle with compression ratio of CR=20 : 1 and cut –off ratio α=2. The air is at 100 kPa=1 bar. 20°C (293K), and the volume of the chamber is 500 cm^3 prior to the compression stroke.

(i) Specific heat capacity at constant pressure of air at atmospheric pressure and room temperature: $C_p = 1.01$ kJ/kgK

(ii) Specific heat capacity at constant volume of air at atmospheric pressure and room temperature: $C_v = 0.718$ kJ/kgK.

(iii) $K = C_p/C_v = 1.4$

Calculate: The mass of intake air, the temperature T2, the pressure P2, the temperature T3, the amount of heat added by burning of fuel-air mixture, the thermal efficiency of this cycle. [8]

Q.3 (a) What is meant by refrigeration system?Describe vapor compression refrigeration system. [8]

(b) What is air conditioning ? Draw and describe different components used in it. [4]

(c) Ice is formed at 0°C from water at 20°C, the temperature of refrigerant is 10°C. Find the ice formed per KWH ,assume latent heat of ice is 334 kJ/kg. Assume working in perfect Carnot cycle. [4]

Q.4 (a) What is gear transmission? Describe different types of gear. [8

(b) Describe with figure different types of belt drive. [4

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(c) Two spur gear have velocity ratio 1/3, driven gear has 72 teeth of 8 module & rotate at 300 rpm, calculate no. of teeth & speed of driver, also calculate pitch line velocity. Given:

T2=72, VR=1/3, N2=300 rpm, m=8mm

VR=N2/ N1= T1/T2=1/3. [4]

Q.5 (a) Write a short note on- [6]

(i) Extrusion

(ii) Rolling

(iii) Drawing

(b) What is metal casting? Describe different methods of metal casting. [5]

(c) Write a brief note on Lathe machine. [5]

Q.6 (a) Describe hardening and tempering of steel. [8]

(b) Describe the following terms- [8]

(i) Case hardening

(ii) Carburizing

(iii) Nitriding

(iv) Cyaniding

(v) Carbonitriding

Q.7 (a) What is Computer Added Design (CAD)? Describe its working. [8]

(b) What is MEMS? Write an essay on it. [8]

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1E2407

Roll No. _____

Total No. of Pages : 3

1E2407

B. Tech. I Semester (Main) Examination, Dec. - 2018

ESC

1FY3-07 Basic Mechanical Engineering

Time : 2 Hours **Maximum Marks : 80**

Instructions to Candidates :

*Attempt all **five** questions from **Part A**, selecting **four** questions from **Part B** and **two** from **Part C**. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

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Part - A

(All questions compulsory)

Short answer questions (up to 25 words) **(5×2=10)**

1. Differentiate between Boyle's law and Charle's law.
2. Describe second law of Thermodynamics.
3. Define the properties of Lubricating oil or Lubricant.
4. Write the comparison between hot working and cold working processes.
5. What do you understand by the following?
   i) Chamfering ii) Baring

Part - B

(Attempt any four questions)

Analytical / Problem solving questions **(4×10=40)**

1. a) A V-belt of 6.4 Cm^3 cross-section has a groove angle 30^0 and the angle of lop of 165^0. The frictional co-efficient is 0.1. The weight of the V-belt is 1.4 Kg/ meter run. The maximum safe stress is 3 N/mm^2. Calculate the power transmitted at the velocity of 20 meter/sec. **(5)**

   b) Explain clearly what is meant by 'entropy' of a gas show on the FS diagram isothermal and adiabatic processes. **(5)**

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2. a) Why is cooling of I.C. engines done? Describe briefly the various cooling methods used in I. C. engines. (5)

b) Explain the working of surface condenser. (5)

3. a) Write short note on Comfort air Conditioning. (5)

b) What are the advantages and disadvantages of Chain drive over belt drive? (5)

4. a) Differentiate between Homogeneous & Heterogeneous systems. (4)

b) Differentiate between welding, brazing and soldering processes. (6)

5. a) What are the advantages of artificial draught system over natural draught system? (5)

b) Derive expression of indicated power for a single stage reciprocating air compressor. (5)

6. a) Explain the various pattern allowances used in foundry. (5)

b) Explain the various engineering materials properties. (5)

Part - C

(Attempt any two)

Descriptive / Analytical / Problem solving / Design question

(2×15=30)

1. a) A four cylinder petrol engine of 250mm bore and 375 mm stroke works on Otto cycle. The clearance volume is 0.01052m^3. The initial pressure and temperature are 1 bar and 47°C. If the maximum pressure is limited to 25 bar, find the following. http://www.rtuonline.com

i. The air standard efficiency of the cycle.

ii. The mean effective pressure for the cycle. (10)

b) The distance between two bearing of a shaft which transmits 200 h. p. at 250 rpm is 250 cm. It is subjected to torsion only. Determine the diameter of the shaft for steady loading if the safe shear stress is 400 Kg/cm^2. (5)

2. a) Describe the procedure for making green sand mould with the help of a sketch. (7)

b) A Fluid system under goes a non- flow frictionless process from $V_1 = 0.12m^3$ to $V_2 = 0.04\ m^3$ in accordance with $V = 4.5/p - 2$ where p is in bar and V is in m^3. During the process, the fluid system rejects 40kJ of heat. Determine change in enthalpy and internal energy. (8)

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(5)

3. a) Define steam boiler & write different types of Boiler

b) 2 kw of power is transmitted by an open belt drive. The linear velocity of belt is 2 m/s. The angle of lop on the smaller pulley is 160^0. The coefficient of friction is 0.25. Determine the effect on power transimission in the following cases:

i. Initial tension in the belt is increased by 8%

ii. Initial tension in the belt is decreased by 8%

iii. Angle of lop is increased by 8% by the use of an idles pulley, for the same speed and the tension on the tight side.

iv. Coefficient of friction is increased by 8% by suitable dressing to the friction surface of the belt. **(10)**

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1E3107

B. Tech. I - Sem. (Main / Back) Exam., - 2023

1FY3 – 07 Basic Mechanical Engineering

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 Describe Law of Thermodynamics?

Q.2 Describe with figure different type of belt drive.

Q.3 Define the coefficient of performance of Refrigerator.

Q.4 What is the pattern in casting process?

Q.5 What is industrial engineering & its scope?

Q.6 Differentiate between water tube and fire tube boiler?

Q.7 Write a short note on different type of power plants.

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Q.8 What is the IP & BP in the Internal Combustion Engine?

Q.9 Describe modern tools used in Mechanical Engineering.

Q.10 Differentiate between impulse and reaction turbine?

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Explain any one type of water tube boiler with neat sketch.

Q.2 Explain differentiate between 2 stroke & 4 stroke engine.

Q.3 How Cavitation can be eliminated by Pump?

Q.4 Describe with figure different types of belt drive?

Q.5 What is air conditioning? Draw and describe different component used in it.

Q.6 Explain the various stages of Heat treatment process?

Q.7 Write short notes on –

(i) Forging

(ii) Drawing

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 What is meant by refrigeration system? Describe vapor compression refrigeration system?

Q.2 What is gear transmission? Describe different types of gear.

Q.3 Describe rolling process with neat sketches.

Q.4 With a suitable sketch explain the working of centrifugal pump.

Q.5 Describe hardening and tempering of steel.

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DETAILED LECTURE NOTES

RTU Paper- 2022-23

Part - A

Que (1) Describe law of Thermodynamics?

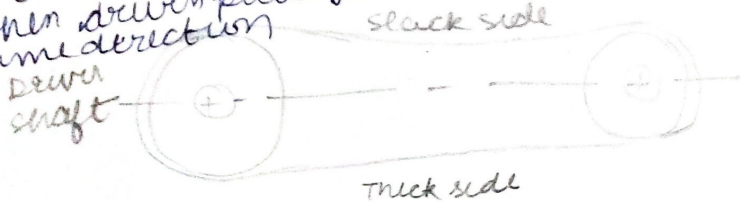
- Zeroth law :-
The Zeroth law of thermodynamics states that if two bodies are individually in equilibrium with a seperate third body then the first two bodies are also in thermal equilibrium with each other

- First law :-
1st law of thermodynamics also known as the law of conservation of energy, states that energy can neither be created nor be destroyed

- Second law :-
2nd law of thermodynamics states that the entropy in an isolated system always increas.

Q Describe with fig different type of Belt drive

→ (1) OPEN BELT DRIVE :- The open belt drive is used, when driver pulley is intencled to be rotated in same direction



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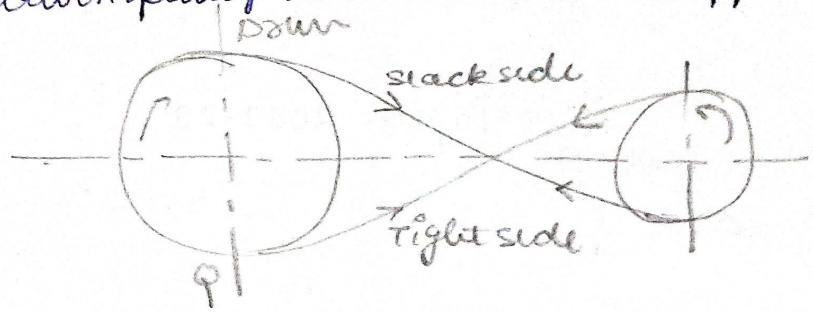
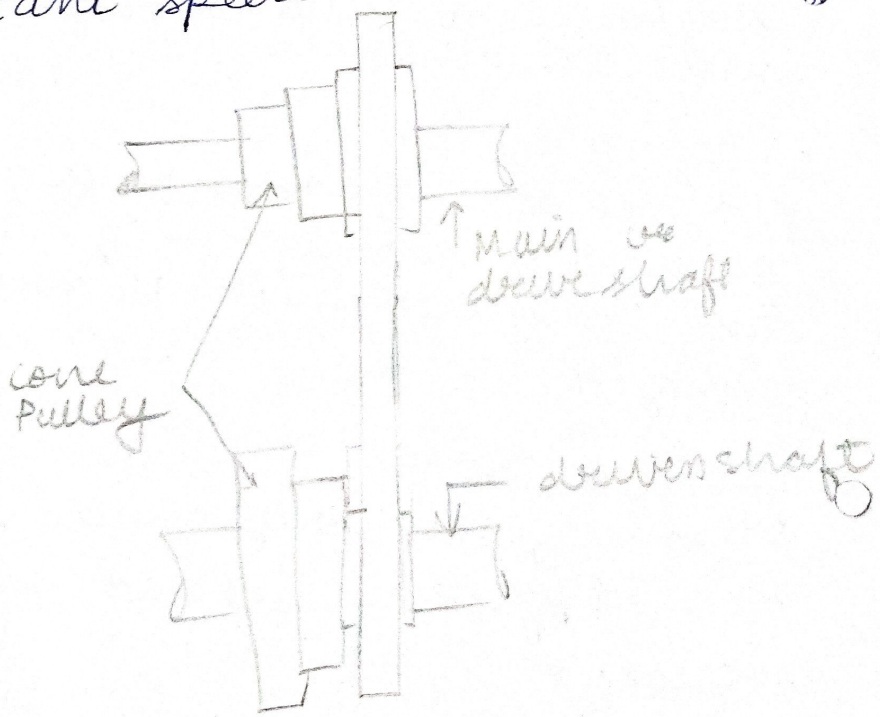
Cross belt Drive :- Cross belt drive is used when driven pulley is rotated in the opposite direction



- Stepped ~~be~~ Drive - Driving shaft rotates at a constant speed.



Que 3 Define coefficient of performance of Refrigerator.

→ When a refrigerator is removing Q amount of Heat consuming W amount of work, then the performance of the refrigerator is determined by the ratio Q/W which is called coefficient of performance

Que 4 what is pattern in casting process

→ ~~The~~ In casting, a pattern is a replica of the object ~~to~~ be cast, used to prepare the cavity into which molten material will be poured during the casting process

Que 5 what is industrial engineering & its scope

→ Industrial engineering is an engineering profession that deals with the development, improvement & implementation of integrated system.
Industrial engineers has the opportunity to work in diversified, like, manufacturing hardware technology.

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Que 6 differentiate b/w water tube & Fire tube boiler

	Fire tube Boiler	water tube Boiler
1	Hot gas passes through the tube with water surrounding them	water passes through the tube with hot gases surrounding them
2	Transport is difficult due to large shell diameter	comparatively easier due to small drum
3	less number of parts	more number of parts
4	water circulation is poor	water circulation is Better
5	Thermal efficiency is low	Thermal efficency is high

Que 7 write a short note on different type of power plant

Ans → Power plants are used for the generation of electric power. To improve the standard of living rapid industrialization is necessary for which adequate electrical power is essential. In India there has been considerable increase in power development and various five year plan

1. steam power plant
2. Nuclear power plant

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(3) gas turbine power plant
(4) Diesel power plant
(5) Hydroelectric power plant
(6) Power from alternate source of energy

Que 8 what is the IP & BP in the internal combustion engine.

→ IP → Indicated power.
Power developed inside the engine cylinder $i_P = \frac{P_m LAN \cdot n}{60}$

BP → Break Powe.
This is actual power available in the crankshaft.

$$b_P = \frac{2\pi NT}{60}$$

Que 9 Describe Moder tools used in mechanical engineering

→ (1) screwdriver
(2) Digital force gauge
(3) ohmmeter
(4) Flow meter
(5) Vibration isolator
(6) caliper

1910

Differentiate b/w impulse & reaction turbine?

8 →

Impulse Turbine	Reaction turbine
Power is obtained due to the impulsive force of the steam	Power is due to both the impulsive force of the incoming steam & the reactive force
Blades are symmetrical	Blades are not symmetrical
Inlet area of moving blade is equal	outlet area of move blade is smaller

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Part- B

Q1 Explain any one type of water tube boiler with neat sketch.

* BABCOCK AND WILCOX BOILER

This is a water tube boiler. It consists of a steam - water drum mounted on fire brick work. Hot gases through the damper. The damper controls the rate of burning and thereby the steam generation. The damper is operated by a chain passing through a set of pulleys. water from the steam water drum comes down to the down take header and then goes to the uptake header through a large number of water tubes, inclined at about 14° for better circulation. It should be noted that there are many different type of babcock and welcox boiler one of the single type is shown in the sketch which is used for medium pressure & capacity. The wet steam comes to the wet steam header through an anti priming pipe. The antipriming pipe removes some moisture from the steam. Then it passes through a large number of superheater tube and reaches the superhecter header. From superheated header. it goes to the main steam valve and finally to the steam turbine.

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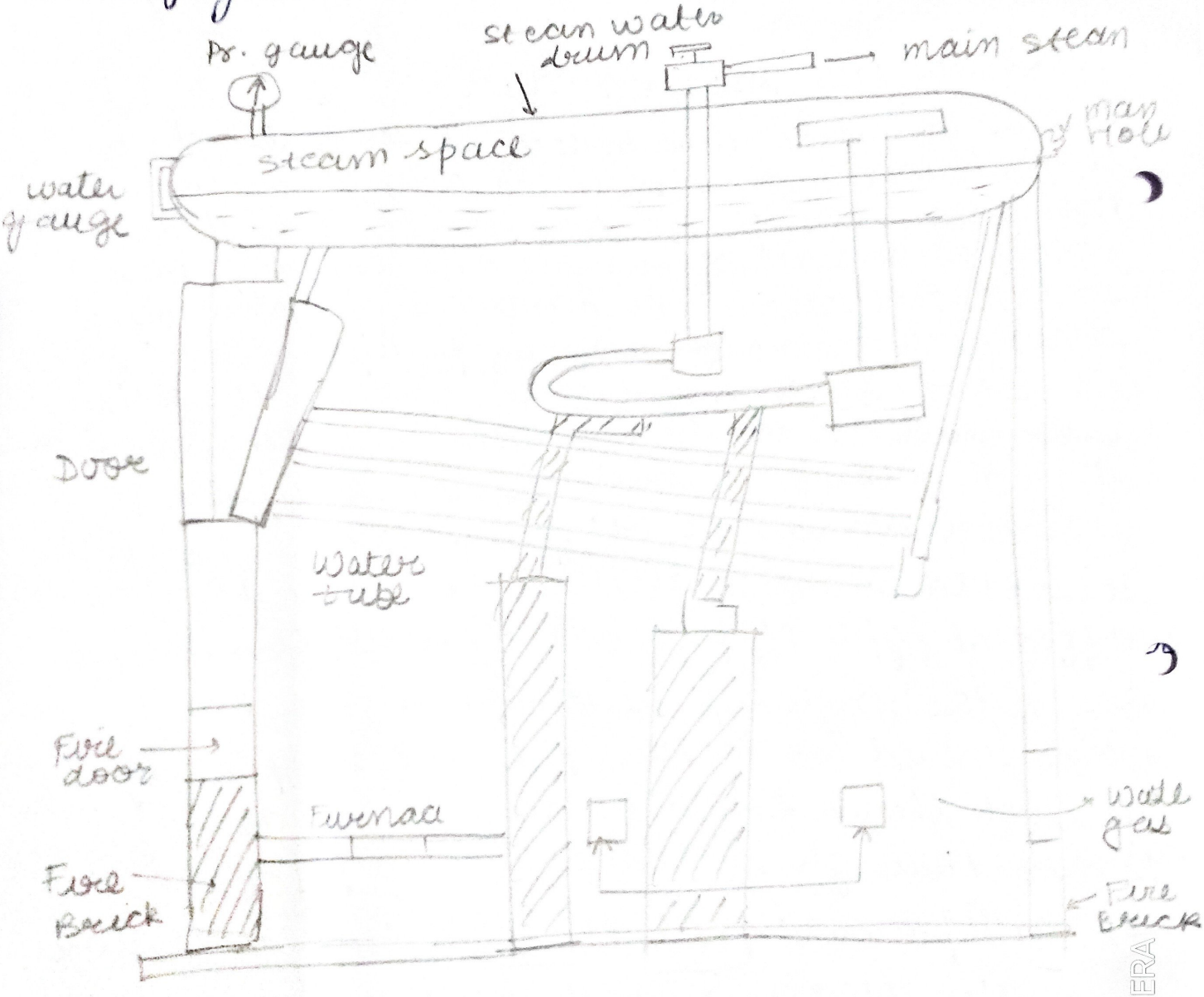
At the end of the downtake header, a mud drum is connected from where impurities can be removed. the boiler is provided with two inspection doors and other mounting such as the water gauge, the pressure gauge & the safety valve



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Explain differentiate between 2 stroke and - 4 stroke engine.

→

	4-Stroke engine	2-stroke-engine
(1)	one working stroke for every 4 stroke or 2 ~~stroke~~ revolution	one working stroke for every 2 strokes or one revolution
(2)	As the number of cycle is less, power output is less for the same cylinder size	Power is more for the same cylinder size - More suitable for a diesel power plant
(3)	The weight of the engine is more for the same output power	The weight of the engine is considerably less.
(4)	operating temperature is less. so, less consumption of lubricating oil	Operating temperature is more
(5)	Variation in torque is more	Torque is uniform
(6)	Noise is less	Noise is more
(7)	Straight Piston is used	Deflector piston is used.

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(3) How cavitation can be eliminated by Pump.

Sol→

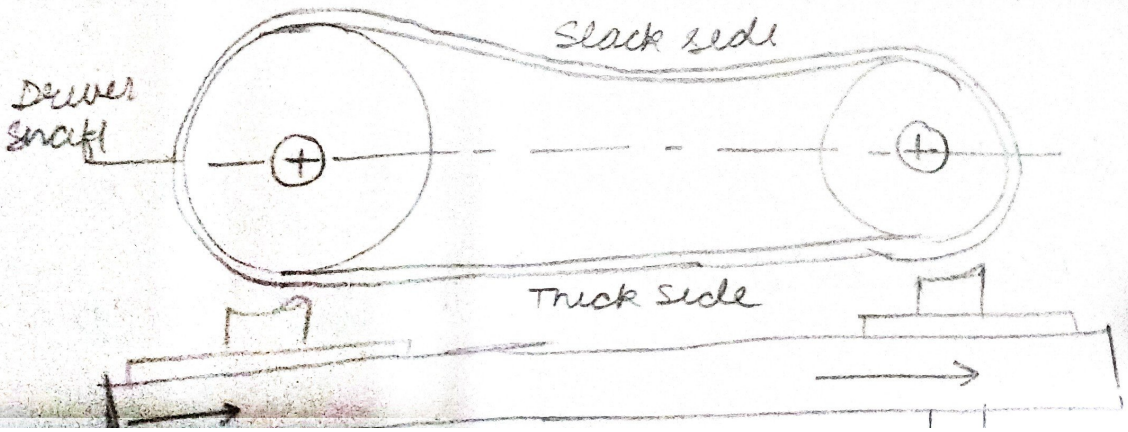
- Increase the upstream reservoirs water level
- Add an inducer to the pump inlet
- Optimize impeller design
- Minimize upstream flow losses
- Operate the pump at lower flow rate

Que 4 Describe with figure different type of belt drive

Sol→

(1) Open Belt drive

- In these type of belt drive, the belt is employing when the two parallel shafts have to rotate in same direction
- When the shafts are far appart, the lower side of belt should be the tight side & the upper side must be the slack side
- This is because the upper side become the slack side, it will sag due to its own weight



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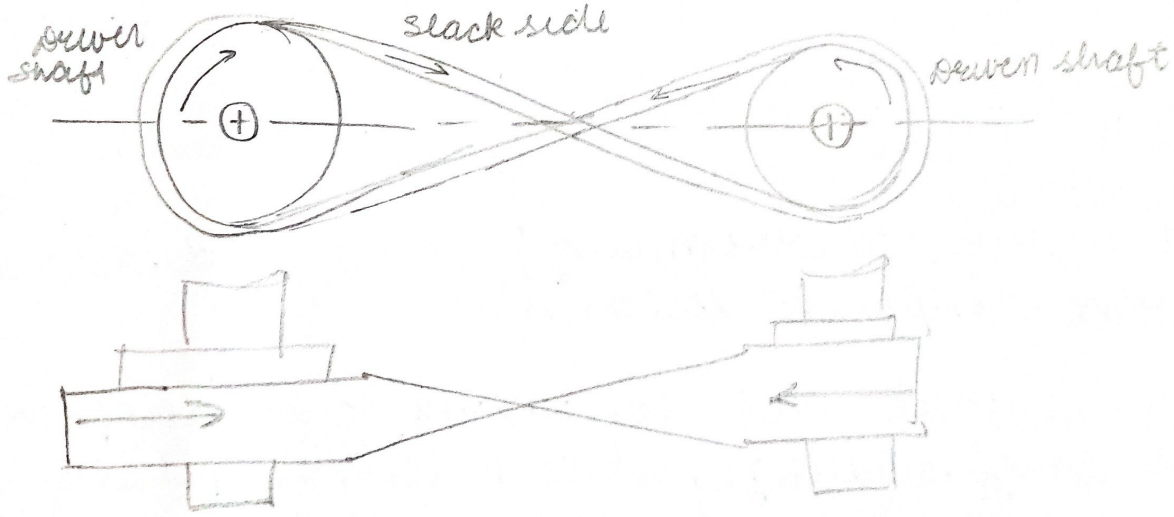
(2) Cross belt drive

- This type of belt drives, the belt is employing when two parallel shafts have to rotate in the opposite direction. At the function where the belts cross, it rubs against itself and wear off



(3) stepped cone pulley.

- This type of belt drive are used when the speed of the driven shaft is to be changed very frequently as in the case of machine tools such as lathe etc

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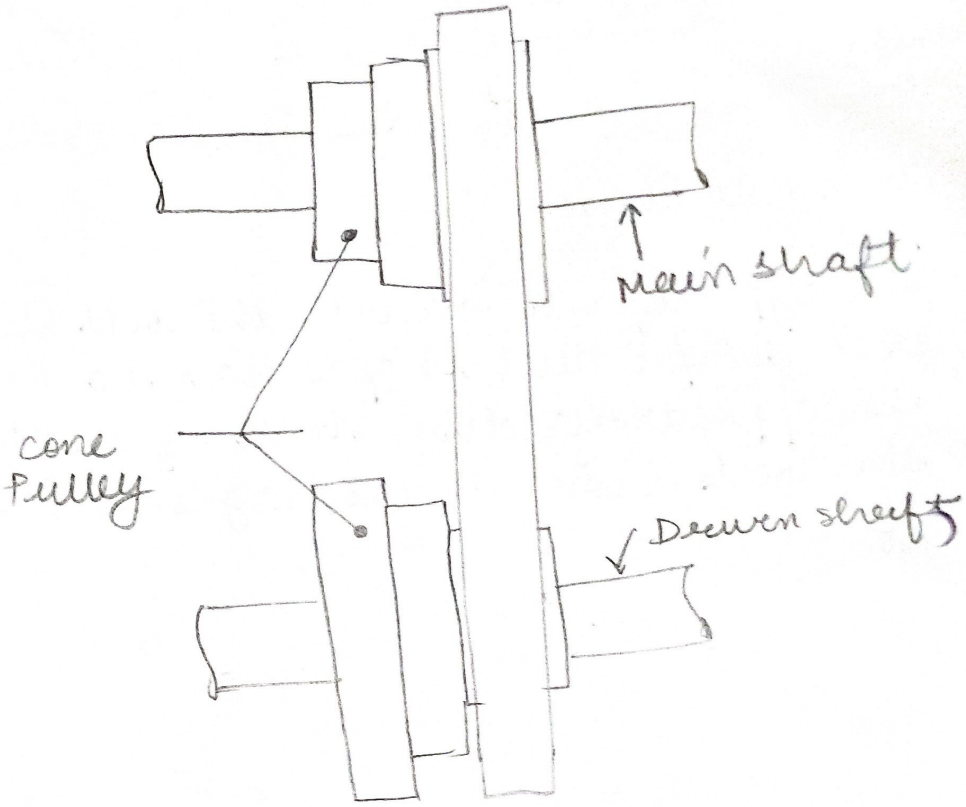
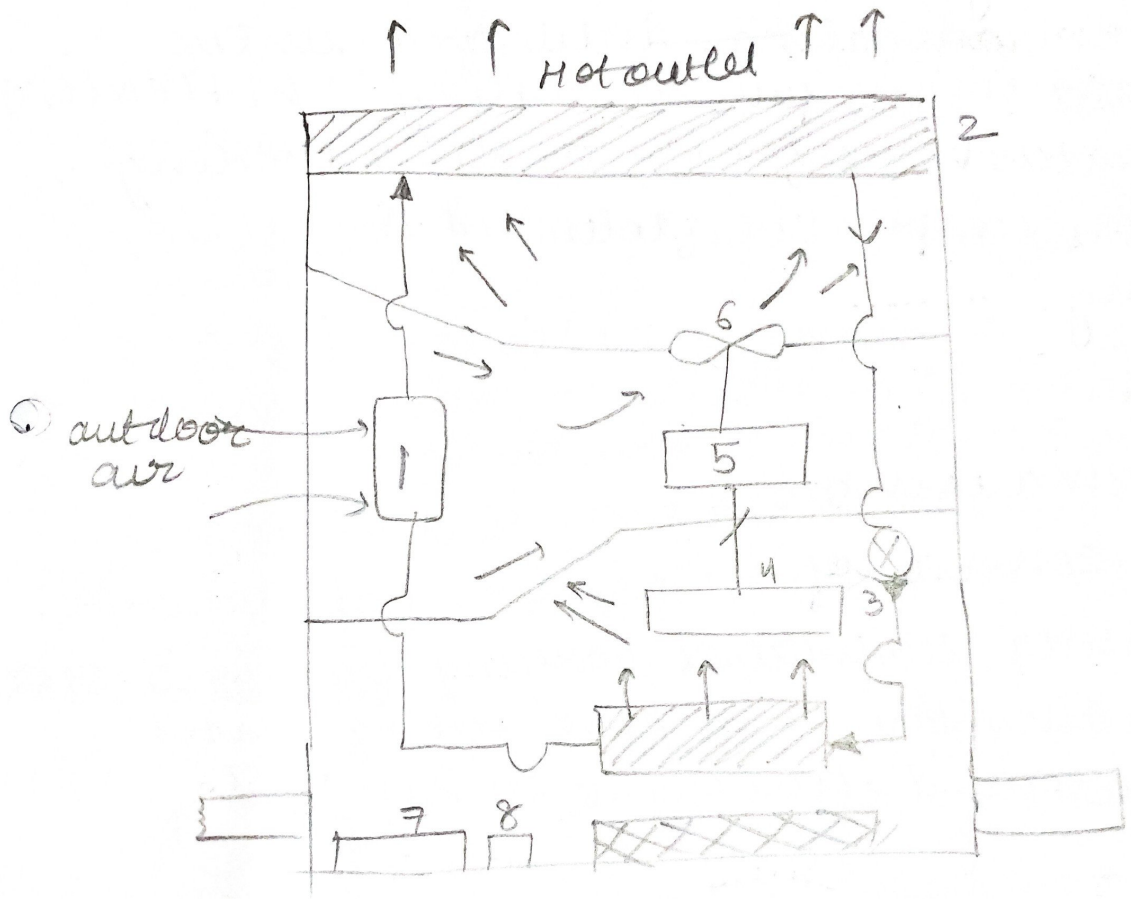


Ques
What is air conditioning? Draw and describe different component used in it

Sol → The central air conditioning is adopted for large buildings, star hotels, hospitals, cinema theaters, etc This system is used only for heavy loads of about 20 tons or more Various components of the central air conditioning system are not assembled at the factory. Instead, they are all assembled at the site in a control room from where conditioned air is distributed to the required places through duct work



(i) explain various process of Heat treatment process.

Sol STAGES OF HEAT TREATMENT

(i) Heating a metal / alloy to definite temp

(ii) Holding at that temp. for the required period to allow necessary changes in the structure

(iii) cooling at a rate necessary to obtain the desired properties

(1) Annealing :-
The term annealing, unless specified means full annealing. The Heating temperature varies from 750 - 950°C, holding at this temperature followed by slow cooling

(2) Normalising :-
This consist of :-
(i) Heating temperature varying from 750 - 975°C
(ii) Holding the workpiece for a short period and allowing it to air cool.

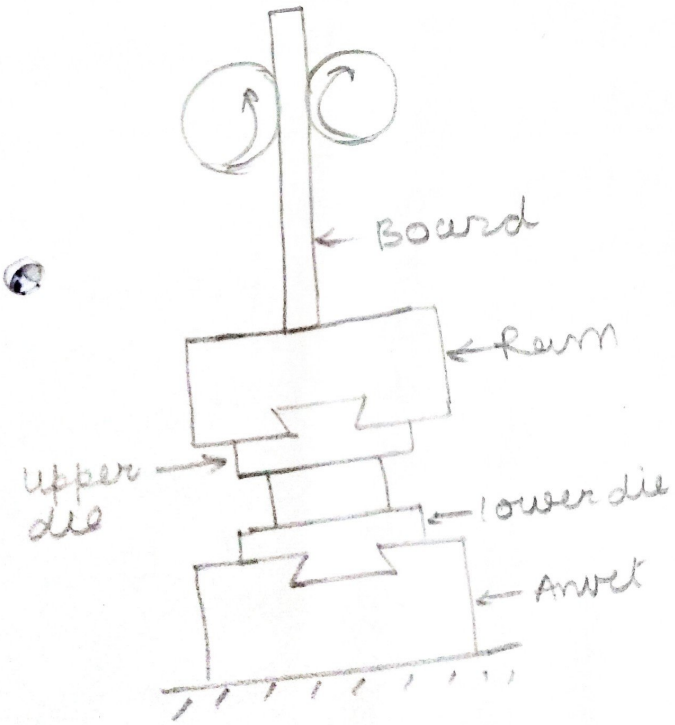
Qu 7 write short note on
(i) Forging
(ii) Drawing

(i) Forging :-
Forging is a metal forming process in which the product of desired shape and size is achieved by pressing or hammering. Forging is ~~a step~~ generally

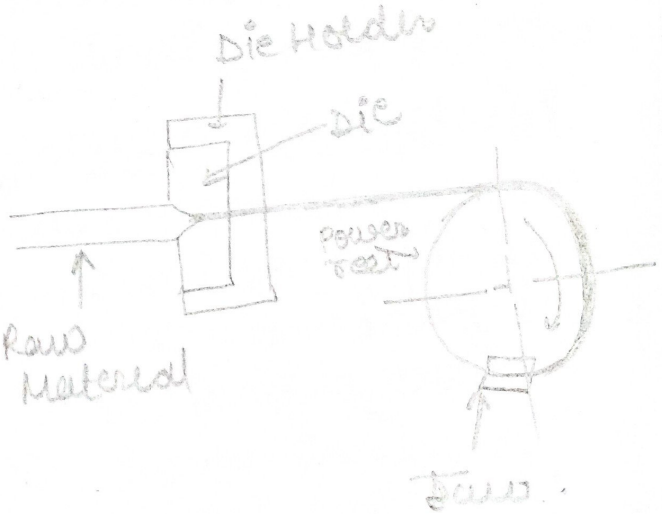
a hot working process, through cold forging is also used for some application

(ii) Drawing

It is the operation in which the cross section area or the thickness of the work piece is reduced with an increase in the length. This is done by stretching the metal piece with flat dies



Forging



Drawing

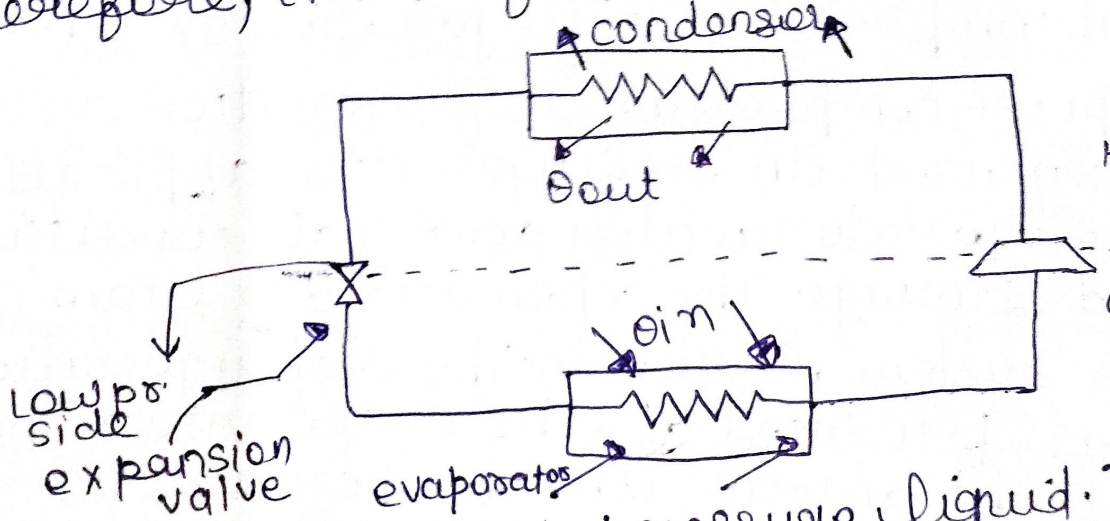
Q.1 What is meant by refrigeration system? Describe vapour compression refrigeration system.

⇒ Sol/ Refrigeration:- Refrigeration is defined as 'The science of providing and maintaining the temperature below that of the surrounding system. For this to be achieved, heat has to be removed from the source at a lower temperature and rejected to the atmosphere at a higher temperature. It is well known that heat can spontaneously flow from higher temperature to lower temperature.

Vapour compression refrigeration systems:-

The vapour-compression refrigeration system is widely used in refrigeration applications like refrigerator, water cooler, air conditioner and cold storage. The schematic diagram of this system is shown. The refrigeration effect is produced at the evaporator. The refrigerant enters the evaporator as wet vapour at a lower pressure and lower temperature. Here, it absorbs its latent heat of vaporisation from the substances kept around the evaporator, thus cooling them. The refrigerant usually comes out

the evaporator with its phase changed to dry saturated or slightly superheated state. Now it enters the compressor which is the heart of the system. The refrigerant vapour is compressed to a higher pressure and higher temperature as superheated vapour in the compressor. For the activity, power is supplied to the motor connected to the compressor and it constitutes the major running cost of the system. The compressed refrigerant vapour is led into the condenser. Generally, atmospheric air is blown over the condenser using a fan and it carries away the latent heat from the refrigerant vapour. Therefore, the refrigerant vapour is



condensed into high pressure liquid. The liquid refrigerant enters the expansion device which can be long spirally wound capillary tube in small refrigerator.

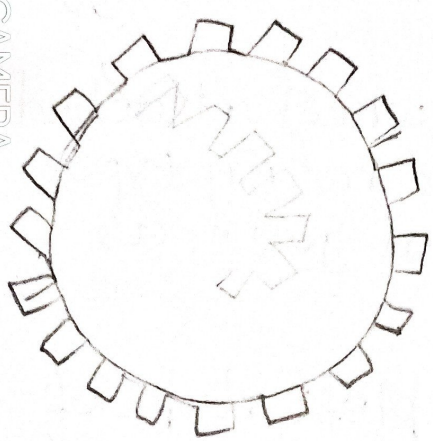
Q2 What is gear transmission? Describe different types of gear.

Sol ⇒ Gears:- A gear is a toothed wheel attached to a rotating shaft. There are many types of gears like spur gear, helical gear, as given

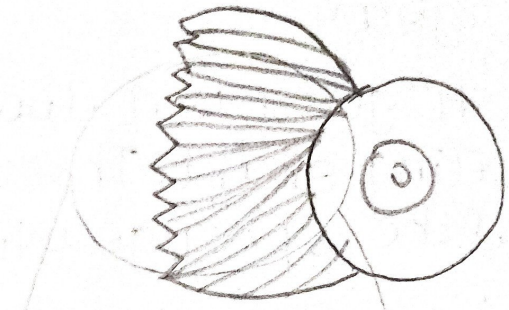
Spur gears:- This is the simplest type of gear. It has teeth parallel to the axis of rotation and it used to transmit rotation from one shaft to another parallel shaft.

Helical Gear:- This gear has its teeth inclined to the axis of rotation. Helical gears are also used for the same applications as spur gears. One major advantage of helical gears is its silent operation. The noise level is much less. In addition, helical gears have the ability to transmit heavy loads at high speeds.

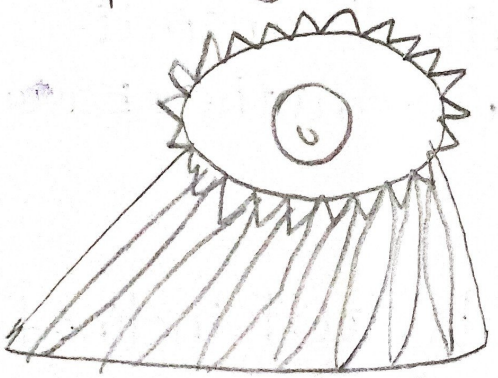
Beval Gears:- These gears have their teeth formed on conical surfaces and are used for transmitting motion Between two shafts at 90°.



Spur gear



Helical gear



(Beval gear)

Application of gears:-

1. To increase or decrease the speed of rotation
2. To reverse the direction of rotation
3. To change the axis of rotation.

Q.3 Describe rolling process with neat sketches.

⇒ Rolling:-

⇒ Rolling is a metal forming process which is achieved by passing the metal between rotating rolls. Rolling is the most widely used manufacturing process because of its high productivity and low cost. Many shapes such as I, T, L and other complex sections are possible to be formed by the rolling process.

In rolling, high compressive forces are applied on the metal by means of the rotating rolls. As a result, the cross-sectional area or the thickness of the metal is reduced with an increase in the length. The schematic view of the rolling process is given in fig. 8.6.

A metal Block with an initial thickness T_1 enters the rolls with a velocity V_p. It is fed into the rolls by friction. It passes through the roll gap and leaves the roll with a velocity of V_1 and the thickness is being reduced to T_p. The rolls rotate in opposite direction.

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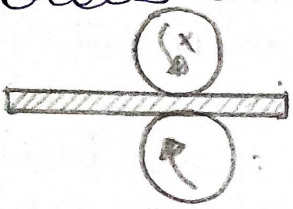
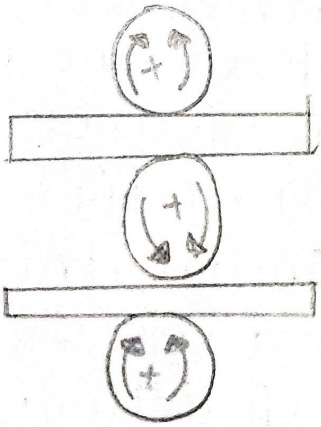
classification of Rolling mills:-

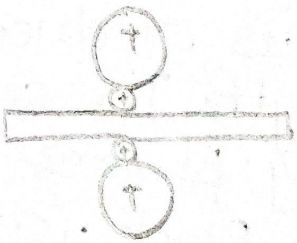
Rolling mills can be classified into various type based on the number of rolls and their arrangement as explained.

Two-high Rolling mills:- It is the simplest and most common type of rolling mill. It has two rolls rotating in opposite directions.



Three-high Rolling mills:- It consists of three rolls placed one over the other. The gap Between the lower roll and the middle roll is usually greater than the gap between the upper roll and middle roll.





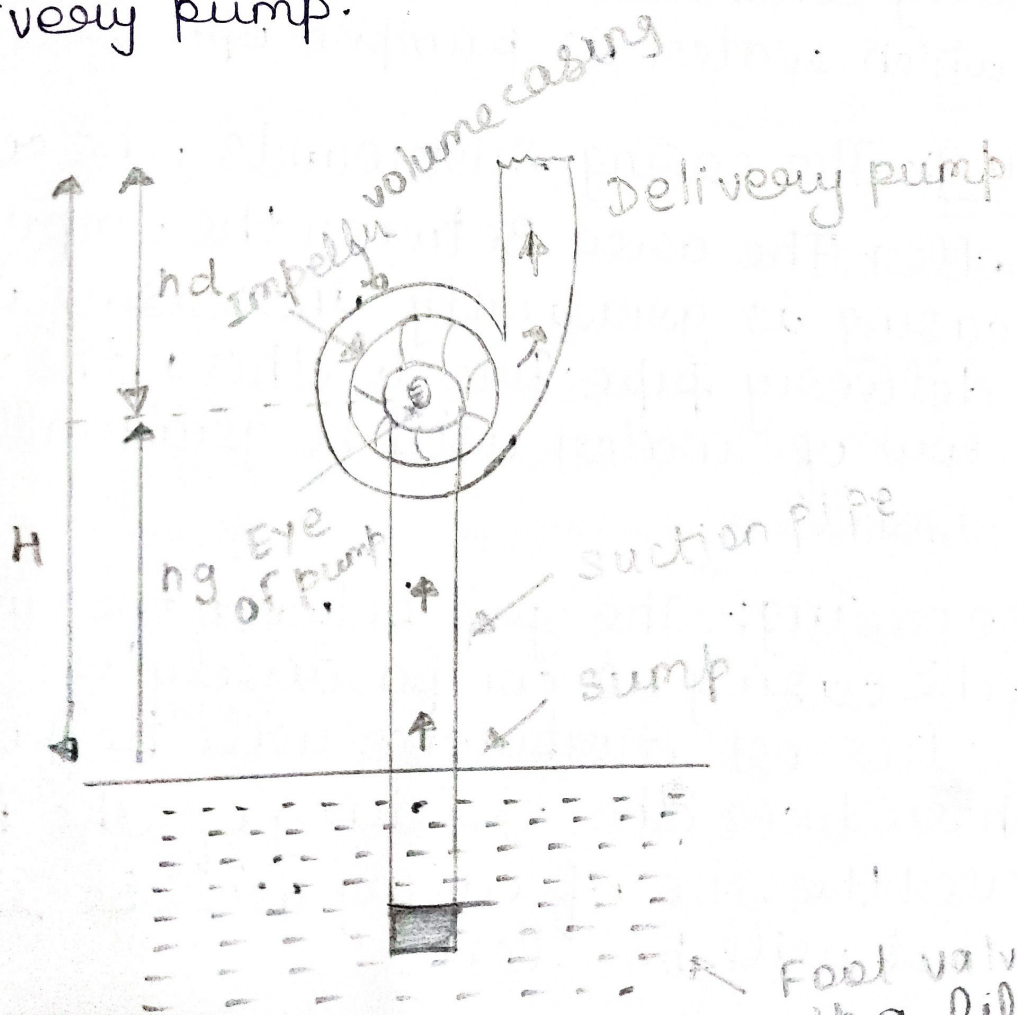
(Four-high Rolling mill)

Four-high Rolling mill:- A four high rolling mill consists of two small-sized working rolls and two large-sized Back-up rolls.

Q.4 With a suitable sketch explain the working of centrifugal pump.

⇒ The main parts of a centrifugal pump are given in fig. It consists of

1. Impeller
2. Casing
3. Suction pipe fitted with a foot valve (one-way valve) and filter; the foot valve will not allow the water to come down
4. Delivery pump.



Impeller:- The impeller is a metallic disc fitted with a number of curved vanes. Initially, water will be poured inside the casing and the process is called priming. So, after priming, the impeller will be immersed in water inside the casing. When the impeller is rotated by an electric motor or an engine, it will produce centrifugal force due to which kinetic energy or velocity energy will be produced in the water. This is finally converted into pressure energy due to which water is pumped up.

Casing:- The casing surrounds the impeller. The area between the impeller and casing is gradually increasing till the delivery pipe. Due to this, the velocity of flow of water will be gradually decreased.

Volume casing:- The gap between the impeller and the casing is comparatively less so the eddies or turbulence will be formed which reduces the efficiency of the pump. However the size of casing will be small and cost will be less

Q5 Describe Hardening and tempering of Steel.

⇒ Hardening and tempering of steel.

Hardening:-

⇒ The Hardening process is applied to almost all the tools and impordant machine various types of steel. It aims to develop high hardness, increased tensile strength, high wear resistance etc. The hardening process is accomplished by heating to a temperature Between the 750 and 950°C holding its for considerable time, then cooling at a fast rate by quenching in water or oil. In steels, hardening capability increases with the carbon or alloy content.

Tempering:-

⇒ The hardening treatment of steels imparts a fine grain size, maximum hardness, minimum ductility and severe internal strains. Being in an unstable condition, it is unsafe to use. So to avoid or minimise problems of cracking and distortion, tempering always follows hardening. The tempering

treatment relieves the strain, decreases Brittleness and restore ductility and improves toughness.

The conventional method of tempering consists of reheating the hardened steel to a range of temperature which extends from room temperature to 400°c and holding it for a considerable time and then subjecting it to slow cooling.

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2E3206

B. Tech. II - Sem. (Main / Back) Exam., - 2023

2FY3 – 07 Basic Mechanical Engineering

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 22ESKSCS199 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 Explain in brief different types of steam turbines.

Q.2 What is priming in pumps? How it is done?

Q.3 Explain the specific function of fuel pump and injector in a diesel engine.

Q.4 Explain scavenging in a 2-stroke engine.

Q.5 State the desirable properties of refrigerants and also list few of the refrigerants used in Air Conditioning.

Q.6 What are the advantages of rope drive as compared to belt drive?

Q.7 Enumerate the various zones in a cupola furnace.

Q.8 What are the different reactions that take place in oxy-acetylene welding?

Q.9 Explain briefly the hot working and cold working of metals.

Q.10 State the main reasons why pig iron cannot be used for industrial applications?

[5×4=20]

PART – B

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 What is compounding in steam turbine? Explain various types of compounding in impulse steam turbine with suitable schematic diagrams.

Q.2 What are the important differences between reciprocating pump and centrifugal pump? Also gives their applications.

Q.3 Compare and contrast the working of vapour compression and vapour absorption refrigeration systems. Draw schematic diagram of each.

Q.4 Describe the different types of gears with sketches.

Q.5 Explain the five types of pattern allowances with appropriate diagrams.

Q.6 Explain the drawing process with a schematic diagram.

Q.7 What are the applications of mild steel, medium carbon steel and high carbon steel?

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 What are the differences between impulse and reaction turbines? Describe the working of Parson's reaction turbine with neat schematic diagram.

Q.2 Explain the differences between a petrol and a diesel engine with neat schematic sketches and diagrams along with suitable examples of some popular models and their applications.

Q.3 What is brazing process? What are brazing materials? Describe various brazing methods and how it is different from braze welding?

Q.4 What are common alloying elements used in steels? Describe the effect of each of them on the properties of steel along with their applications.

Q.5 Describe the Closed-Cycle OTEC System with a neat sketch. How it differs from Open-Cycle OTEC system?

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Important Question Unit 1

		Marks	CO	BL	PO
Q.1	What is pump? What is priming?	1	CO1	L1	PO1
Q.2	Describe the classification of IC engines?	1	CO1	L1	PO1
Q.3	What are the differences between fire tube and water tube boilers?	1	CO2	L2	PO1
Q.4	What are the differences between impulse and reaction impulse turbine?	2	CO2	L2	PO1
Q.5	State basic difference between 2 stroke and 4 stroke engines.	2	CO2	L2	PO1
Q.6	What are steam boilers? State some applications of steam boilers?	2	CO3	L3	PO1
Q.7	We want to discharge water from lower head to a limited height but we need high discharge, so which type of pump we can use explain with proper working.	2	CO3	L3	PO1
Q.8	What are the main parts of steam turbine? What is the function of steam nozzle?	2	CO3	L3	PO1
Q.9	With the help of neat diagram explain the layout of steam power plant.	3.5	CO3	L3	PO1
Q. 10	An engine working on air standard Otto cycle has a cylinder diameter of	3.5	CO4	L4	PO2

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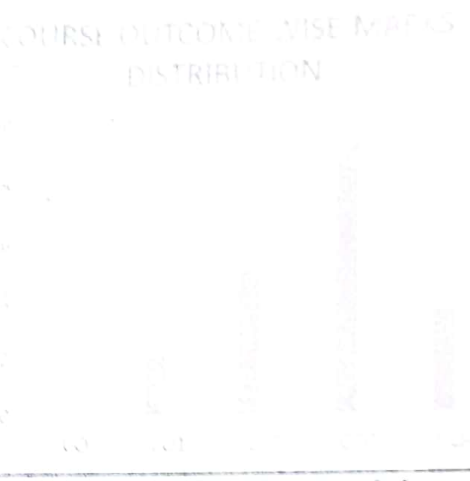
	10 cm and stroke length of 15 cm. The ratio of specific heats for air is 1.4. If the clearance volume is 196.3 cc and the heat supplied per kg of air per cycle is 1800 kJ/kg, then work output per cycle per kg of air is.	

BLOOM's LEVEL WISE MARKS DISTRIBUTION	

BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analyzing, 5 – Evaluating, 6 - Creating)

CO – Course Outcomes; PO – Program Outcomes

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Important questions Unit 1

		Marks	CO	BL	PO
Q.1	What do you understand by compounding of steam turbine? Explain pressure compounding for two stage impulse steam turbine..	2	CO3	L3	PO1
Q.2	Elaborate laws of thermodynamics and gas laws of thermodynamics.	2	CO1	L1	PO1
Q.3	What are the differences between fire tube and water tube boilers?	2	CO2	L2	PO1
Q.4	Differentiate among the terms open system, closed system and isolated system.	2	CO2	L2	PO1
Q.5	With the help of neat diagram explain the layout of steam power plant.	2	CO3	L3	PO1
Q.6	Explain the working of Locomotive and Cochran boiler with suitable diagram.	2	CO3	L3	PO1
Q.7	Explain the importance of CAD/CAM with some industrial examples.	2	CO3	L3	PO1
Q.8	What are the main parts of steam turbine? What is the function of steam nozzle?	2	CO3	L3	PO1
Q.9	Define mechanical engineering and its scope?	2	CO1	L1	PO1
Q. 10	Explain the working of steam power plant with the suitable	2	CO1	L1	PO1

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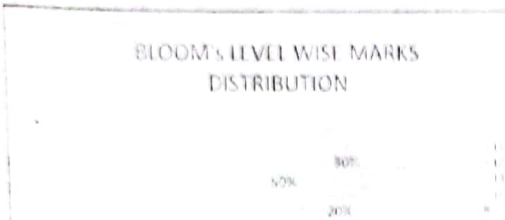
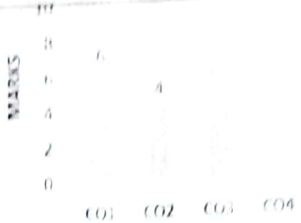
	diagram.	





BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analyzing, 5 – Evaluating, 6 - Creating)

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Important Question Unit 1

		Marks	CO	BL	PO
Q.1	Write down the difference between fire tube and water tube boiler.	2	CO3	L3	PO1
Q.2	Elaborate laws of thermodynamics and gas laws of thermodynamics.	2	CO1	L1	PO1
Q.3	What is the meant by pressure compounding and velocity compounding?	2	CO2	L2	PO1
Q.4	Explain different types of boiler mountings.	2	CO2	L2	PO1
Q.5	With the help of neat diagram explain the layout of steam power plant.	2	CO3	L3	PO1
Q.6	What is thermodynamic system? Differentiate various types of system in thermodynamics.	2	CO3	L3	PO1
Q.7	Explain the importance of CAD/CAM with some industrial examples.	2	CO3	L3	PO1
Q.8	What are the main parts of steam turbine? What is the function of steam nozzle?	2	CO3	L3	PO1
Q.9	Define mechanical engineering and its scope?	2	CO1	L1	PO1
Q. 10	Explain the working of steam power plant with the suitable diagram.	2	CO1	L1	PO1

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★ ~~Assignment No~~ - 1 ★

Unit-1 Important Questin

Que 1.> Define thermodyramics. Explain open system, closed system and isolated system.

Ans.> Thermodyramics is the branch of science that deals the transfer of Energy and its effect on physical properties of substance. It is the relationship between heat, Energy and work.

a) Open System: A system that allows both mass and energy transfer across the boundaries is called the open system. Example: A cup of coffee without lid

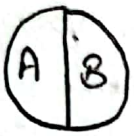
b) Closed system: A system in which mass is fixed and energy may be transferred from system to the surrounding is known as closed system. E.g. ⇒ A cup of coffee with lid, Piston cylinder without valve

c) Isolated System: There is no interaction between system and surrounding is known as isolated system. E.g. Thermous flask. (No transfer of mass & energy

Que 2.> Explain the laws of thermodyramics & gas law of thermodyramics

Laws of Thermodynamics

(1) Zeroth Law of thermodynamics: If System 'A' is in thermal equilibrium with system 'B' & system 'B' is also in thermal equilibrium with system 'c', then according to zeroth law of thermodynamics System 'A' & System 'c' be in the thermal equilibrium



if $T_A = T_B$



if $T_B = T_C$

then,



$$\boxed{T_A = T_C}$$

Note: Zeroth law is the basics of temp. measurement

(2) First Law of thermodynamics: When a system operating in a cycle the net heat supplied to the system from the surrounding is equal to the net workdone on the surrounding.

$$\boxed{\oint dQ = \oint dW}$$ ∵ ∮ represent the sum of a complete cycle.

First Law of thermodynamics for process: When a process is executed by a system, the change in internal energy is equal to the difference b/w heat supplied and work done during any change of state.

$$\boxed{\Delta U = Q - W}$$ ∵ ΔU = change in internal energy.

Q = Heat added to system

W = Work done by the system.

(3.) Second Law of thermodynamics :

i) **Clausius Statement:** It is impossible to construct a cycle transfer heat from cooler body to hotter body without any work done.

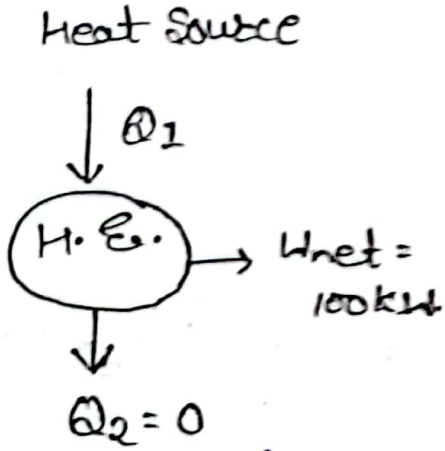
- Heat can't, of itself, flow from a lower to a higer temperature. It means that work must be
- Supplied to the heat pump refrigerator to transfer heat from a cold body to a hot body.

ii) **Kelvin-Planck Statement:** It is impossible to construct a device that operates in a cycle to recieve heat from a single reservior and produce net amount of work. It means we can ~~say~~ say that no heat engine can have a thermal efficiency of 100%

Efficiency of heat Engine :

$$\eta = \frac{\text{work done}}{\text{heat supplied}}$$

$$\eta_{H.E} = 1 - \frac{Q_2}{Q_1}$$



- Q_2 = heat rejected from H.E
- Q_1 = heat supplied to H.E

Note: if $Q_2 = 0$

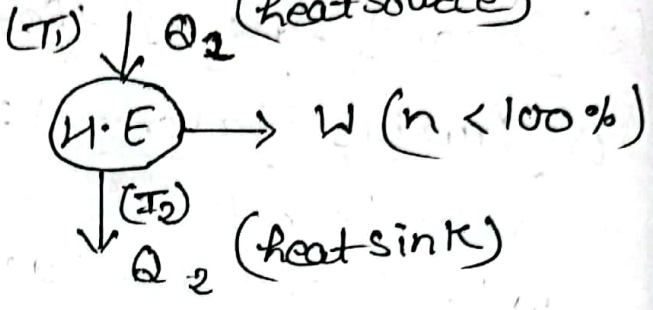
then $\eta = 100\%$. which is not possible

It means that inorder to operate a heat engine at least two thermal reservioue at different temperature are essential i.e a heat source and a heat sink.

$T_1 > T_2$

$W = Q_1 - Q_2$

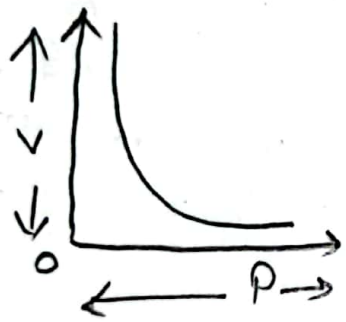
$\eta < 100\%$



Gas Laws of thermodynamics:

1 **Boyle's Law:** $\left(V \propto \frac{1}{P}\right)_{T = \text{constant}}$

if the temp. of a gas remain constant, the volume of gas is inversly proportional to the pressure.



$\left(V \propto \frac{1}{P}\right)_T$

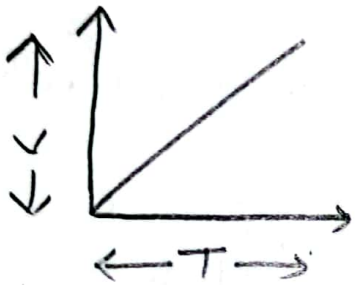
$V = C/P \Rightarrow PV = C$

or $\boxed{P_1V_1 = P_2V_2}$

2 **Joule's Law:** Internal energy is a function of temp. only. It means the internal energy of an ideal gas doesn't change, if volume and pressure changes (but does changes if temp. changes)

3. Charle's Law: $(V \propto T)_{P\text{-constant}}$

Charle's Law states that when any gas is heated at constant pressure, the volume of a gas is directly proportion to absolute temp.



$V \propto T$ at P constant

$V = KT$

$\boxed{\frac{V}{T} = K}$, constant

if a gas initially at a volume V_1 & absolute temp. T_1 is heated at constant pressure such that its new volume is V_2 & absolute temp. T_2, then according to charle's Law.

$$\frac{V_1}{T_1} = \frac{V_2}{T_2} \quad (\text{if } P_1 = P_2)$$

4. Gay-Lussac's Law: $(P \propto T)$ at V-constant

The pressure exerted by a gas is directly proportional to the temp. of the gas where volume is constant. $P \propto T$ at V = constant,

$$\boxed{\frac{P}{T} = K}$$

An ideal gas obeys the perfect gas equation as following: $\boxed{PV = mRT}$

It m
at lec
temp
heat

where, P = Pressure of gas (N/m^2)
V = volume of gas (m^3)
m = mass of gas (kg)
R = Gas constant (J/kgK)
T = absolute temp. of gas (Kelvin)

Ques:) What are differences b/w fire tube & water tube boilers?

Ans:)

Water Tube Boiler	Fire tube Boiler
1. Water is inside the tubes & flue gas surrounded to it	1. Flue gases inside the tubes and water outside.
2. operating pressure is upto 165 bars (High Pressure boiler)	2. upto 25 bars (low or medium Pressure boilers)
3. Steam generation heat is very high (more than 450 tones/hr)	3. less steam generation rate (8 tones/hr)
4. Suitable for Power plants	4. Suitable for small industries
5. Provided steam of power plants for electric generation	5. Provide steam in chemical and pharmaceutical industries.
6. operation cost is high	6. operation cost is low.
7. Skilled labour required.	7. Don't required skilled labours
E.g. Babcock and willcox boiler	E.g. Vertical, locomotive boilers.

Que 4:> What are the differences between impulse & reaction impulse turbines ?

Ans:>

* Impulse *	Reaction Impulse *
1. It consist of nozzles and moving blades.	1. It consist of fixed blades which act as nozzles & moving blades.
2. Steam is expanded completely in the nozzles all the P.E is converted into K.E.	2. Steam is partially expanded in the fixed blades. Some amount converted in K.E.
3. Potential of steam is constant over the moving blade.	3. Potential drop takes place in moving blades.
4. Because of high potential drop in nozzle, blade speed and steam speed are high.	4. Because of small potential drop blades speed & steam speed are less.
5. Low efficiency	5. High efficiency.
6. Occupies less space per unit power.	6. occupies more space per unit power.

It means that inorder to operate a heat engine at least two thermal ...

Que 6.> What are steam boilers? State some applications of steam boilers.

Ans.> A steam boiler or generator is defined as a closed vessel in which water is converted into steam by burning fuel in presence of air at desired temp., pressure and at desired mass flow rate. 6)

* Applications:

1.> Used in steam turbins to develop electrical energy
2.> Used to run steam engines.
3.> In textile industries, Sugar mills or in chemical industries as a cogeneration plant.
4.> Heating the building in cold weather.
5.> Producing hot water for hot water supply.

Que 7.> Give three examples each of boiler mounting and boiler accessories?

Ans.> Mounting: 1.> Safety valves
2.> Water level indicator
3.> Pressure Gauge.

Accessories: 1.> Feed pump
2.> Injector
3.> Economiser.

Que 8.> What are the main parts of a steam turbine? What is the function of a steam nozzle?



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Ans.> Steam turbine is one of the most important prime mover of generating electricity. This falls under the category of power producing turbomachine.

Parts: 1.> Nozzle 2.> Rotor 3.> Blades
4.> Casing

Function: In steam turbines normally convergent and divergent type of nozzles are used. When the steam flows through the nozzles there is a pressure drop which is converted into the velocity or K.E. It also guides the steam in proper direction to strike the blades. It is placed very close to the blades to minimize the loses.

Q. Ques.> Define Mechanical Engineering & its scope

Ans.> Mechanical Engineering is the discipline that applies the concept of Engineering physics, Engineering mathematics & material science principles to design, analysis, manufacture and maintain mechanical system.

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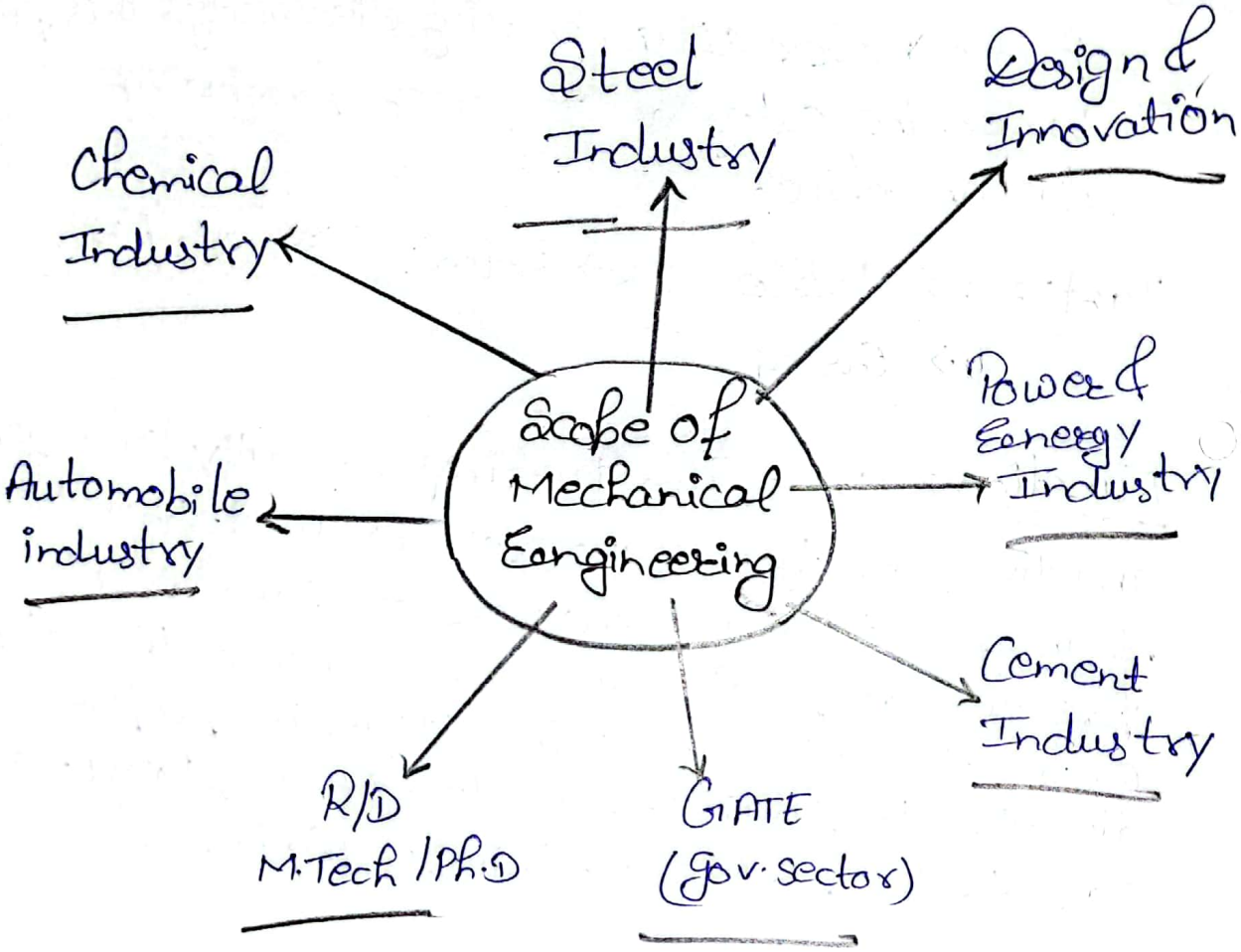


Que 10> Explain the working of steam power plant with suitable diagram?

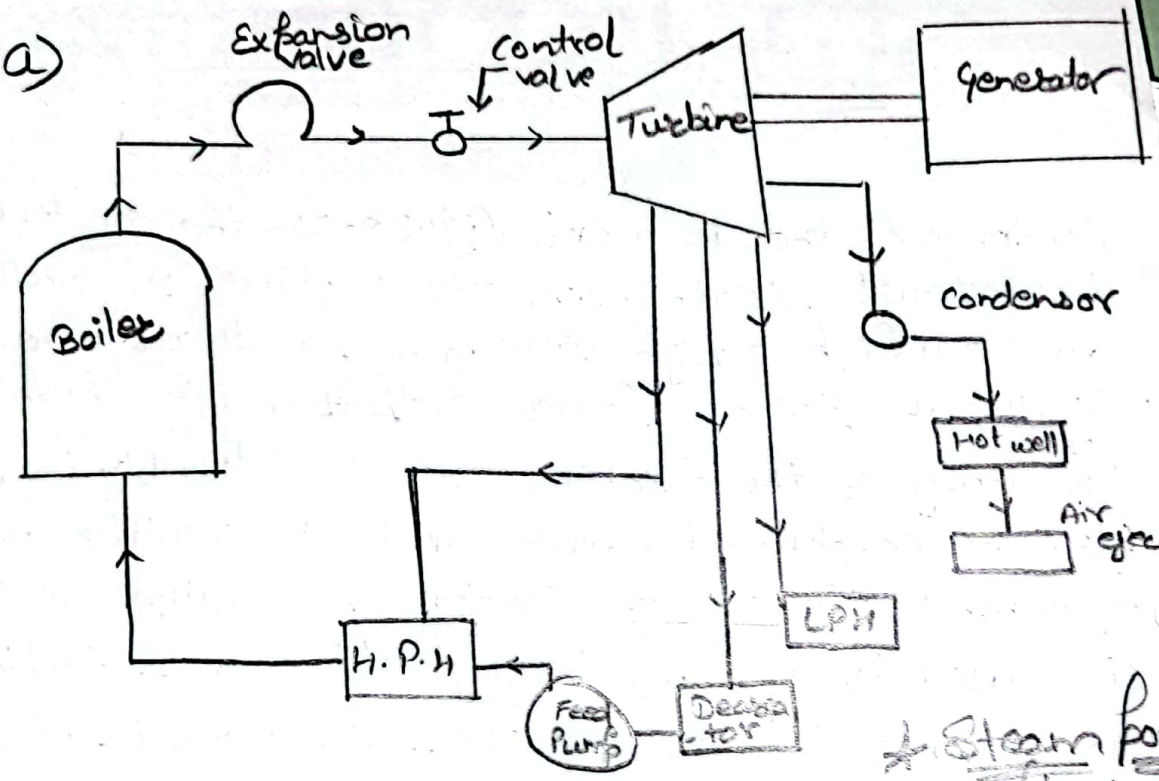
Ans> **Working**: Steam from the boiler is taken to the turbine through the steam pipe fitted with an expansion joint. The joint provides a flexible connection to prevent any crack in the steam pipe which is subjected to explain & in the steam like pipe and contraction due to the variation in temp. from the turbine, the steam enters a condensor, details

Condensor are in next figure. In the condensor the exhaust steam from the turbine is condensed due to which a high vacuum is produced. Due to high vacuum is the power output & the thermal efficiency of the turbine are considerably increased Also the condensed water can be reciculated in the system. In the system Condensor, cooling water is circulated by a pump through the water tuble to condense the exhaust steam. The cooling tower to cool & to recirculated the same water if the power plant is not located on the bank of river or a lake.

The condensate from the condensor before entering the boiler is subjected to following treatment.

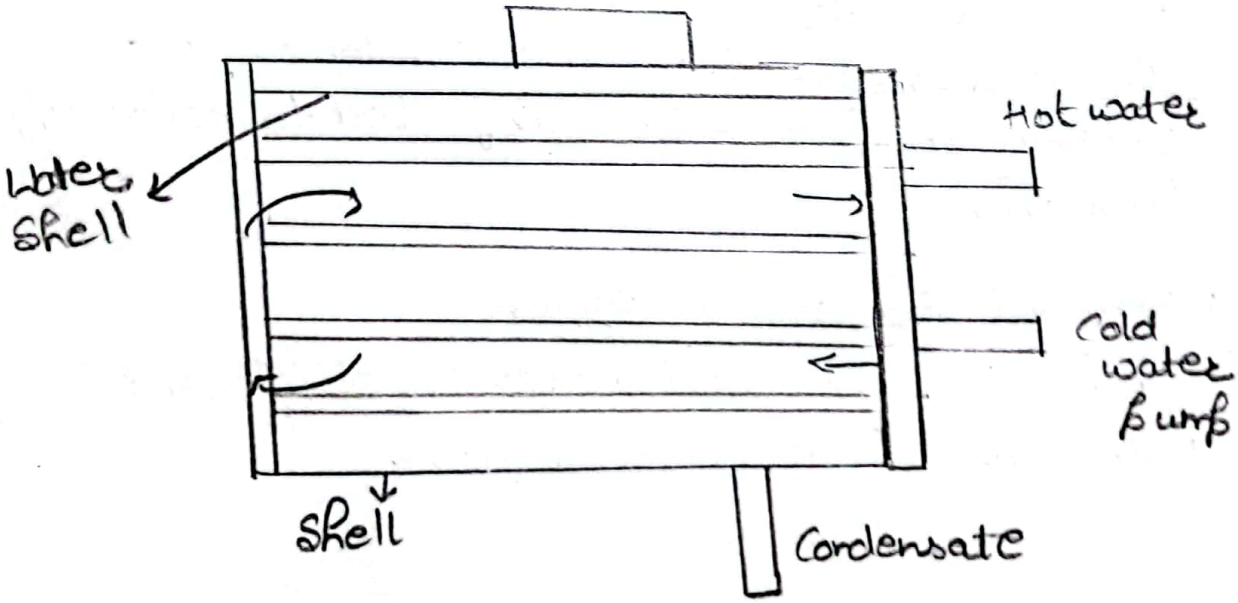
(1) Removal of air & oxygen
(2) Preheating the feed water in different stages using LPH, a deareater & HPH.

a)



* Steam power plant *

b)



* Steam Condeser *

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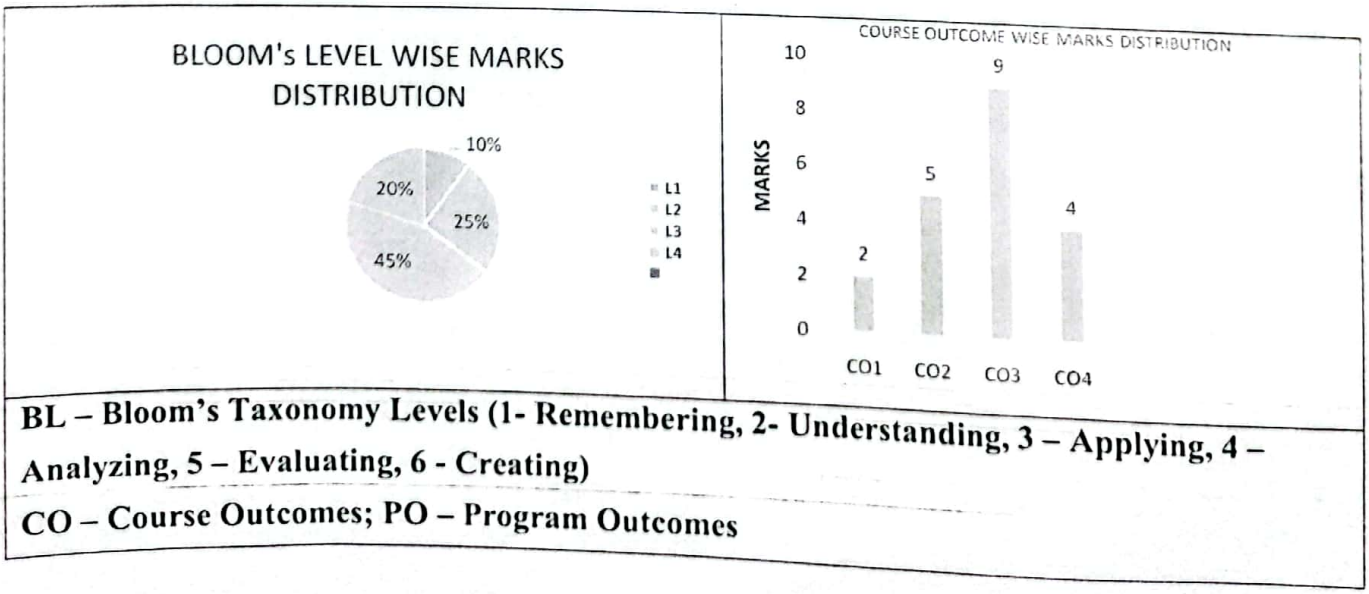
Important questions Unit 4

		Marks	CO	BL	PO
Q.1	Explain the open belt and cross belt drives	1	CO1	L1	PO1
Q.2	List the methods to reduce the slip in belt and pulley	1	CO1	L1	PO1
Q.3	Explain ratio of friction tensions, centrifugal tension in a belt	1	CO2	L2	PO1
Q.4	What is Gear? Explain different types of gear for transmission of power with suitable diagram	2	CO3	L1	PO1
Q.5	Derive an expression for the length of open belt derives.	3	CO3	L3	PO1
Q.6	State the types of chains & sprockets.	2	CO2	L2	PO1
Q.7	What are the advantages of 'V' belt drive over flat belt drive ?.	2	CO2	L2	PO1
Q.8	Classify different types of power transmission system.	2	CO3	L3	PO1
Q.9	A belt is running over a pulley of diameter 100 cm at 300 rpm. The angle of contact is 150o and coefficient of friction between the belt and the pulley is 0.3. If the maximum tension in the belt is 3000N, find the power transmitted by the belt	4	CO4	L4	PO2
Q. 10	Explain power transmitted by belts and ropes	2	CO3	L1	PO1



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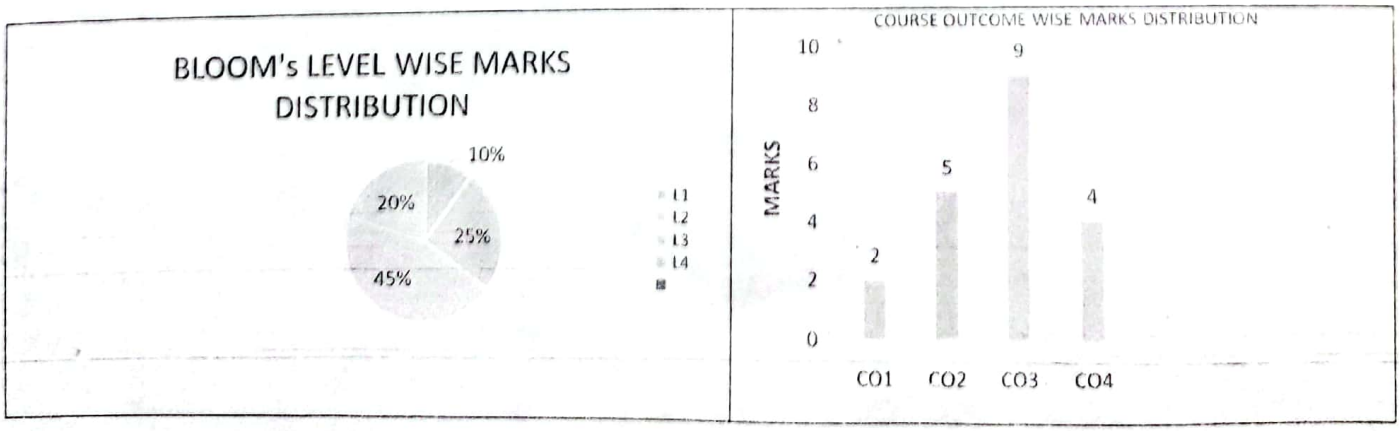
Important Question Unit 4

		Marks	CO	BL	PO
Q.1	What is slip?	1	CO1	L1	PO1
Q.2	Explain the velocity ratio of belt drive with the consideration of slip.	1	CO1	L1	PO1
Q.3	Why gear drives are known as positive power transmission drive?	1	CO2	L2	PO1
Q.4	What is Gear? Explain different types of gear for transmission of power with suitable diagram.	2	CO3	L1	PO1
Q.5	Derive an expression for the length of open belt derives.	3	CO3	L3	PO1
Q.6	Write down the difference between flat belt and v belt drive	2	CO2	L2	PO1
Q.7	Difference between Slip and creep.	2	CO2	L2	PO1
Q.8	Classify different types of power transmission system.	2	CO3	L3	PO1
Q.9	Two pulleys, one 450 mm diameter and the other 200 mm diameter are on parallel shafts 1·95 m apart and are connected by a crossed belt. Find the length of the belt required and the angle of contact between the belt and each pulley. What power can be transmitted by the belt, when the larger pulley rotates at 200 rev/min, if the maximum permissible tension in the belt is 1 KN, and the coefficient of friction between the belt and pulley is 0·25 ?	4	CO4	L4	PO2
Q. 10	You want to transfer a power upto 15 meter which power transmission drive you will adopt. Explain with the suitable diagram.	2	CO3	L1	PO1



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DETAILED LECTURE NOTES

Unit-4 important Questi

Power Transmission System

Q1. What is slip?

Ans The difference between the speed of pulley and belt. The relative motion betⁿ pulley and belt is known as slip.

Due to insufficient grip of friction betⁿ pulley and belt there are some relative motion in betⁿ those two is present. This motion is called slip of belt.

Q2. Explain the velocity ratio of belt drive with the consideration of slip.

Ans Velocity ratio of belt drive is defined as the ratio betⁿ the speed of the driven pulley (follower) and the speed of driving pulley (driver).

It is expressed mathematically as:-

$$\frac{\text{Speed of follower}}{\text{Speed of driver}} = \frac{\text{Diameter of driver}}{\text{Diameter of follower}}$$

Q3. Why gear drivers are known as positive power transmission drive?

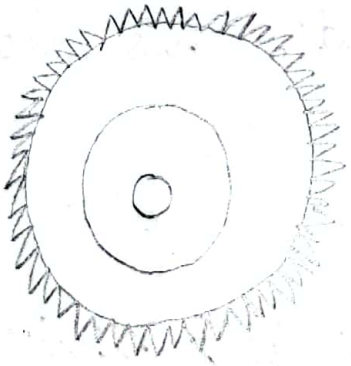
Ans Gear drivers are known as positive power transmission drive because there is no slip in gear drive as belt drive. There is no frictional slip so, it is called as positive power transmission

Q4. what is gear? Explain different types of gear for transmission of power with suitable diagram?

Ans A gear is a toothed wheel attached to a rotating shaft. There are many types of gears like spur gear, helical gear, bevel gears.

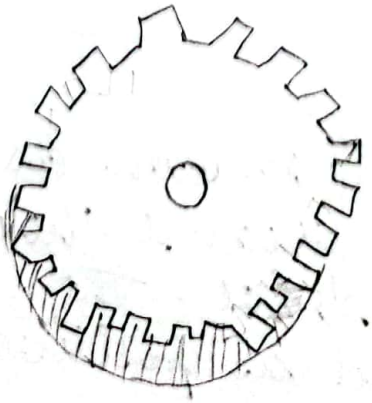
- Spur gear —

This is the simplest type of gear. It has teeth parallel to the axis of rotation and is used to transmit rotation from one shaft to another parallel shaft.



- Helical gear —

This gear has its teeth inclined to the axis of rotation. It also used for the same application as spur gear. It has silent operation. It has ability to transmit heavy loads at high speeds.



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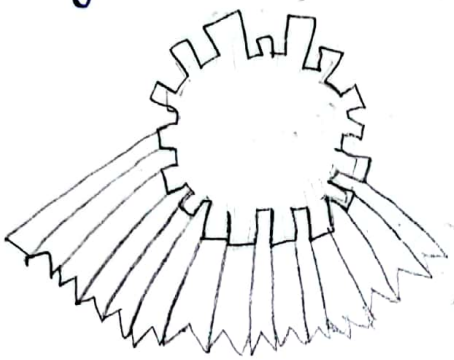
- Bevel gear - These gears have their teeth formed on conical surfaces and are used for transmitting motion betⁿ two shaft at 90°



Q5. Derive an expression for the length of open belt drives.



Let r_1 and r_2 be radius of largen and smaller pulley.

X → distance betⁿ centres of pulley.

L → Total length of belt.

Let the belt leaves largen pulley at E & G1 and the

smaller pulley F and H.

from figure $O_2M \perp O_1E$

Let $\angle O_1O_2M = \alpha$ radian

$L = \text{Arc } GJE + EF + \text{Arc } FKH + HG_1$

$= 2(\text{Arc } JE + EF + \text{Arc } FK) \quad -(1)$

$$\sin\alpha = \frac{O_1M}{O_1O_2} = O_1E - \frac{EM}{O_1O_2}$$

$$= r_1 - \frac{r_2}{x}$$

$\because \alpha$ is very small angle.

$\sin\alpha = \alpha = r - \frac{r_2}{x}$

$\therefore \text{Arc } JE = r_1\left(\frac{\pi}{2} + \alpha\right)$

$\text{Arc } FK = r_2\left(\frac{\pi}{2} - \alpha\right)$

and $EF = MO_2 = [(O_1O_2)^2 - (O_1M)^2]^{1/2}$

$= [x^2 - (r_1 - r_2)^2]^{1/2}$

$= x[1 - \{(r_1 - r_2)/x\}^2]^{1/2}$

Using binomial theorem.

$EF = x[1 - \{0.5\{(r_1 - r_2)/x\}^2 + \ldots] = x - (r_1 - r_2)^2/2x$

$\therefore L = 2\left[r_1\left(\frac{\pi}{2} + \alpha\right) + x - \frac{(r_1 - r_2)^2}{2x} + r_2\left(\frac{\pi}{2} - \alpha\right)\right]$

$$= \pi (r_1 + r_2) + 2x (r_1 - r_2) + 2x - \frac{(r_1 - r_2)^2}{x}$$

$\because \alpha = \frac{r_1 - r_2}{x}$

$$L = \pi (r_1 + r_2) + 2x \left(\frac{r_1 - r_2}{x}\right)(r_1 - r_2) + 2x - \frac{(r_1 - r_2)^2}{x}$$

$$= \pi (r_1 + r_2) + \alpha \frac{(r_1 - r_2)^2}{x} + 2x - \frac{(r_1 - r_2)^2}{x}$$

Q6. Write down the difference between flat belt and V-belt drive.

Ans

Flat Belt	V- Belt
1° Suitable for shorter center distance bet^n the shaft.	1° For longer centre distances.
2° Trapezoidal section.	2° Rectangular section
3° Frictional grip is more.	3° Friction grip is less.
4° Since more than one belt can be used power transmitted will be more.	4° Since single belt can be used power transmitted is less.
5° Velocity ratio is high.	5° Velocity ratio is low
6° Slip is seldom possible.	6° Slip occurs easily.

Q. Difference between slip and creep.

Ans Creep is due to the elastic property of the belt whereas, the conventional slip is due to insufficient frictional grip betⁿ the belt and pulley. Both reduces the speed ratio.

Q8. Classify different types of power transmission system.

Ans Types of Power transmissions are -

i) Gear
ii) Pulley & Belts
iii) Chain drive
iv) Friction wheel
v) Worm drivers

We will discuss about gear and belt transmission system.

- Gears —

A gear system is composed of two or more toothed wheels that connect and interact with each other, it transmits a rotating motion.

- Belts and Pulley —

A belt and pulley system is composed of a pulley that rotates and pulls the belt which in turn transmits the motion to a second pulley.

Q9. Two pulley, one 450 mm diameter and the other 200mm diameter are on parallel shaft 1.95m apart and are connected by a crossed belt. Find the lenght of belt required and the angle of contact bet^n the belt and each pulley. what power can be transmitted by the belt, when the larger pulley rotates 200 rev/min, if the max^m permissible tension in the belt is 1 KN and the coefficient of friction bet^n in belt and pulley is 0.25?

Ans Given $d_1 = 450mm = 0.45m$

$d_2 = 200mm = 0.2m$

$r_1 = 0.225m$

$r_2 = 0.1m$

$x = 1.95m \quad N_1 = 200 rpm \quad T_1 = 1KN = 1000N$

$\mu = 0.25$

- speed of belt $(V) = \frac{\pi d_1 N_1}{60}$

$= \frac{\pi \times 0.45 \times 200}{60}$

$= 4.714 m/s$

- Lenght of belt -

$L = \pi(r_1 + r_2) + 2x + \frac{(r_1 + r_2)^2}{x}$

$= \pi(0.225 + 0.1) + 2 \times 1.95 + \frac{(0.225 + 0.1)^2}{1.95}$

$= 4.975 m$

• Angle of contact for each pulley and belt =

θ = angle of contact

$$\sin\alpha = \frac{r_1 + r_2}{x} = \frac{0.225 + 0.1}{1.95}$$

$$\simeq 0.667$$

or $\alpha = 9.6°$

$$\theta = 180° + 2\alpha$$

$$= 180° + 2(9.6°)$$

$$= 199.2°$$

$$\Rightarrow \frac{199.2}{180} \times \pi = 3.477 \text{ radian}$$

• Power

T_2 = tension in slack side of belt.

$$2.3 \log\left(\frac{T_1}{T_2}\right) = \mu\theta \Rightarrow 0.225 \times 3.477$$

$$= 0.8692$$

$$\log\left(\frac{T_1}{T_2}\right) = \frac{0.8692}{2.3} = 0.378$$

$$\frac{T_1}{T_2} = 2.387$$

$$\therefore \quad T_2 = \frac{1000}{2.387} = 419\ N$$

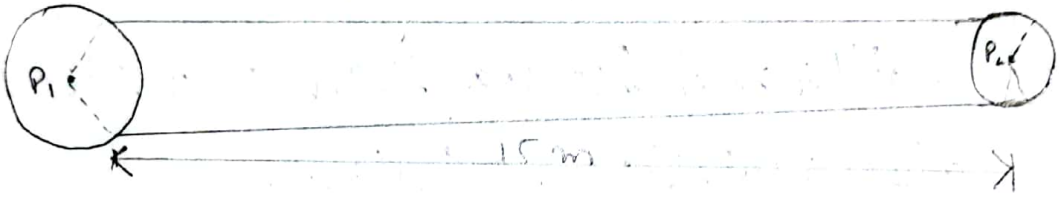
$$P = (T_1 - T_2)\, V$$

$$= (1000 - 419)\, 4.714$$

$$= 2740\ W \Rightarrow 2.74\ kW$$

Q10. You want to transfer a power upto 15 m. which power transmission drive you will adopt explain with the suitable diagram.

Ans. To transmit power within 15 m distance we will belt drive for power transmission and for more that 15 m we can use Rope drive.



- Rope drives

The rope drives are widely used to transmit large amount of power from one pulley to another, over a long distance. Ropes are made of cotton, hemp, manila or steel wire. The frictional grip in the case of rope drive is more than the belt drive. One of the main advantages of rope drive is that a number of drives can be taken from one driving pulley. for example, in many spinning mills, the line shaft on each floor is driven by ropes passing directly from the main engine pulley on the ground floor. For a rope drive, the

• groove angle of the pulley is normally 45°.

• Steel wire rope

- This is used to transmit larger power over longer distances, compared to cotton rope or hemp rope. Wire ropes are used for cranes, elevators etc, Unlike fibre ropes which are wedged between the slides of the grooves, steel ropes rest at the bottom of the grooves in the pulley.

Following are the advantages of wire ropes -

1. It can withstand heavy load and shock load.
2. It can also withstand fatigue.
3. It is more durable.
4. It is highly reliable.

∴

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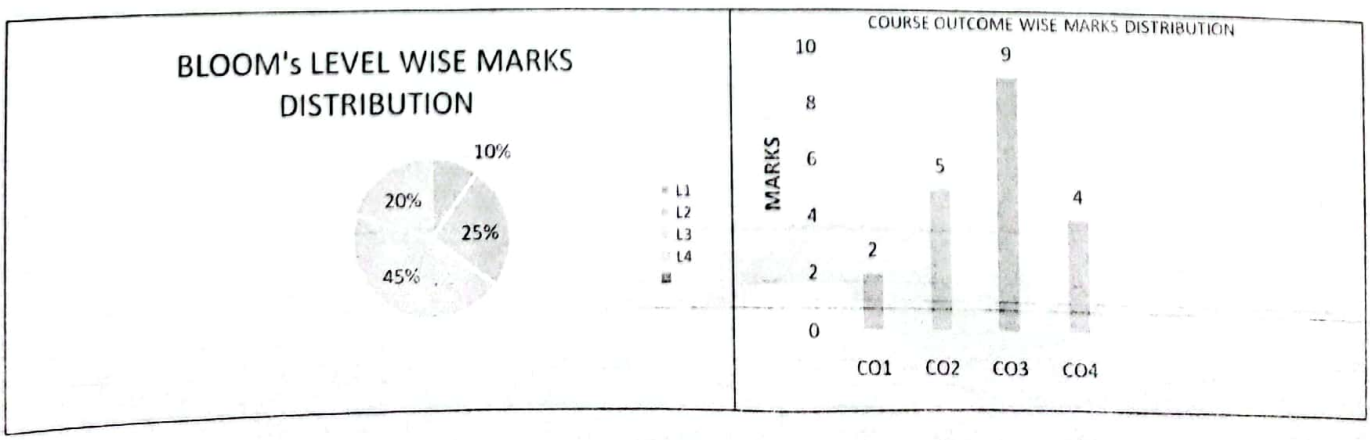
Important questions Unit 4

		Marks	CO	BL	PO
Q.1	How are drives classified?	1	CO1	L1	PO1
Q.2	Compare cross belt drive and open belt drive on the basis of: (i) Velocity ratio. (ii) Direction of driven pulley. (iii) Length of belt drives (iv) Application.	1	CO1	L1	PO1
Q.3	Explain steep and creep phenomenon in belts.	1	CO2	L2	PO1
Q.4	State the type of power transmission chains. Describe any one with its sketch	2	CO3	L1	PO1
Q.5	Define 'Gear Train'. State its purpose and types of gear train..	3	CO3	L3	PO1
Q.6	State the types of chains & sprockets.	2	CO2	L2	PO1
Q.7	What are the advantages of 'V' belt drive over flat belt drive ?.	2	CO2	L2	PO1
Q.8	Generally, the lower side is kept "Tight side" and upper side is kept as "Slack side" with the belt drives having small driving pulley and big driven pulley. Why ?	2	CO3	L3	PO1
Q.9	Find the width of the belt, necessary to transmit 7.5 kW to a pulley 300 mm diameter, if the pulley makes 1600 rpm and the co-efficient of friction between the belt and pulley is 0.3. Assume the angle of contact as 180o and the maximum tension in the belt is not to exceed 8 N/mm width.	4	CO4	L4	PO2
Q. 10	State types of gear train and explain any one.	2	CO3	L1	PO1



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POORNIMA COLLEGE OF ENGINEERING, JAIPUR

B.TECH. (I Semester) **Roll No……**

I MID TERM EXAMINATION 2022-23

Code: 1FY3-07 Category: PCC Subject Name–BASIC MECHANICAL ENGINEERING (BME)

Course Credit: 02

Max. Time: 2 hrs. **Max. Marks: 60**

NOTE:- Read the guidelines given with each part carefully.

Course Outcomes (CO):

At the end of the course the student should be able to:

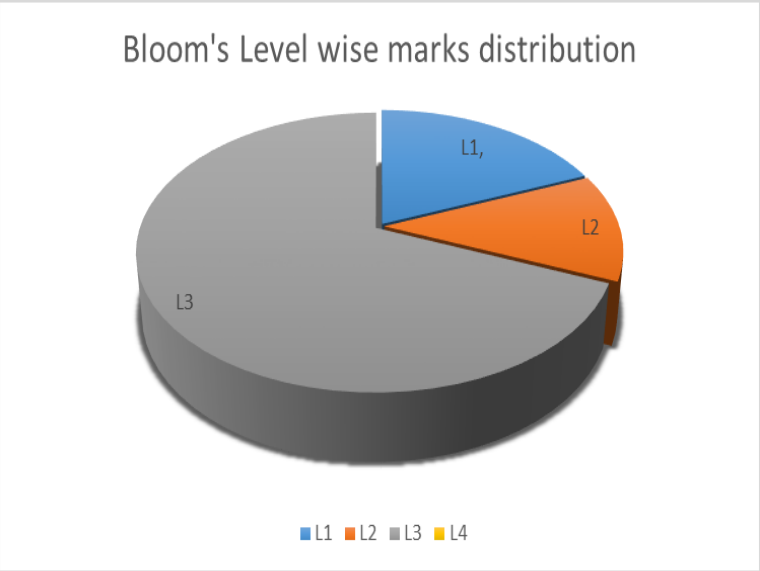
CO1: Students will be able to retrieve basic concepts of thermal and manufacturing processes. **(Recall/Remembering)**

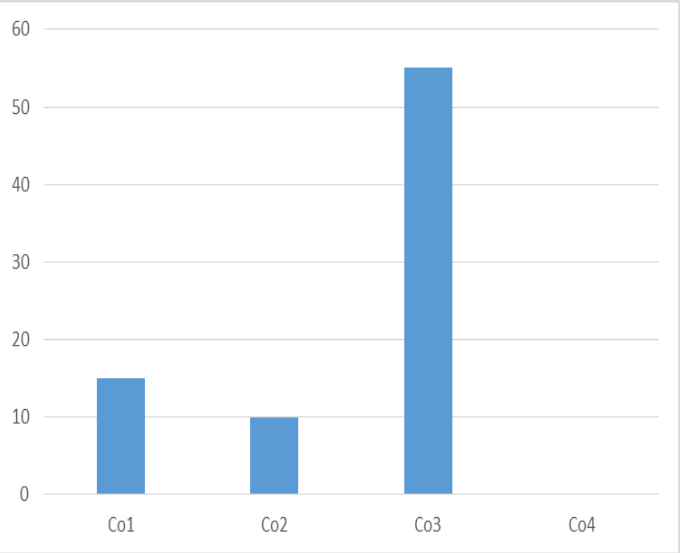
CO2: Students will able to compare different types of thermal and manufacturing processes and. **(Understand)**

CO3: Students will be able to annotate about the functioning of turbine & pumps, IC engines, refrigeration system, modes of transmission of power, materials and primary manufacturing process. **(Apply)**

CO4: Students will be able to appraise the fundamental knowledge of thermal engineering, in addition to understanding of power transmission to solve the industrial and societal issues. **(Examine)**

	PART - A: (All questions are compulsory) Max. Marks (10)				
		Marks	**CO**	**BL**	**PO**
Q.1	Explain the term thermodynamics briefly.	**2**	**1**	**1**	**1**
Q.2	Give the definition of the fire tube boiler.	**2**	**1**	**1**	**1**
Q.3	Define the term manufacturing technology.	**2**	**1**	**1**	**1**
Q.4	State the term “one ton of refrigeration”.	**2**	**1**	**1**	**1**
Q.5	What do you mean by the coefficient of performance (COP) of a refrigerator?	**2**	**1**	**1**	**1**
	PART - B: (Attempt 4 questions out of 6) Max. Marks (20)				
Q.6	What are refrigerants? Explain the desirable properties of a refrigerant.	**5**	**1**	**1**	**1**
Q.7	Explain the working principle of window air conditioner with suitable sketch.	**5**	**3**	**3**	**1**
Q.8	Write down the difference between two strokes SI and CI Engine.	**5**	**2**	**2**	**1**
Q.9	Explain the importance of industrial engineering with some industrial examples.	**5**	**3**	**3**	**1**
Q.10	Differentiate among the terms open system, closed system and isolated system.	**5**	**2**	**2**	**1**
Q.11	How would you classify the internal combustion engines?	**5**	**3**	**3**	**1**
	PART - C: (Attempt 3 questions out of 4) Max. Marks (30)				
Q.12	Explain the air-conditioning in the refrigeration and air-conditioning system. Why is it important in the concern of human comfort?	**10**	**3**	**3**	**1**
Q.13	Describe the working diesel power plant with the help of neat diagram.	**10**	**3**	**3**	**1**
Q.14	Explain the working of a four stroke diesel engine with the help of a suitable diagram?	**10**	**3**	**3**	**1**
Q.15	What do you understand by compounding of steam turbines? Explain pressure compounding for two stage impulse steam turbines.	**10**	**3**	**3**	**1**





BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analyzing, 5 – Evaluating, 6 - Creating)

CO – Course Outcomes; PO – Program Outcomes

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

I B.TECH. (II Sem.) Roll No. _____

FIRST MID TERM EXAMINATION 2022-23

Code: 2FY3-07 Category: PCC Subject Name–BASIC MECHANICAL ENGINEERING

(BRANCH – MECHANICAL ENGINEERING)

Course Credit: ___

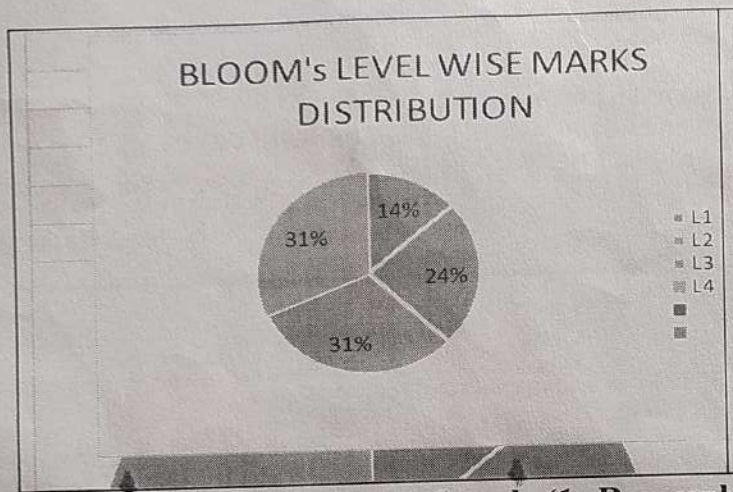
Max. Time: 2 hrs. Max. Marks: 60

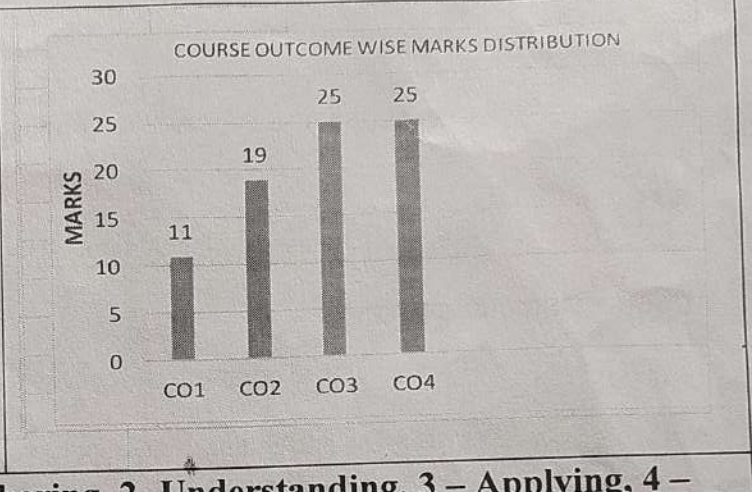
NOTE:- Read the guidelines given with each part carefully.

Course Outcomes (CO):

(CO1)	Students will be able to retrieve basic concepts of thermal and manufacturing processes. (Recall/Remembering)
(CO2)	Students will be able to compare different types of thermal and manufacturing processes. (Understand)
(CO3)	Students will be able to annotate about the functioning of turbine & pumps, IC engines, refrigeration system, modes of transmission of power, materials and primary manufacturing process. (Apply)
(CO4)	Students will be able to appraise the fundamental knowledge of thermal engineering, in addition to understanding of power transmission to solve the industrial and societal issues. (Examine)

		Marks	CO	BL	PO
	PART - A: (All questions are compulsory) Max. Marks (10)				
Q.1	What do you mean by System, boundary, and surrounding?	2	1	1	1
Q.2	Define the terms: Thermodynamic work, heat and specific heat.	2	1	2	1
Q.3	Give classification of Steam Boilers.	2	2	2	1
Q.4	Name the essential components of an IC engine.	2	1	1	1
Q.5	Define the term coefficient of performance (COP) & unit of refrigeration.	2	2	1	1
	PART - B: (Attempt 4 questions out of 6) Max. Marks (20)				
Q.6	Give the statements of Zeroth, I and II law of thermodynamics.	5	1	2	1
Q.7	Differentiate between water tube and fire tube boiler.	5	2	2	1
Q.8	Explain the construction and working of a single acting reciprocating pump with a neat sketch.	5	3	3	1
Q.9	Differentiate between spark ignition and compression ignition engines.	5	2	2	1
Q.10	Demonstrate the working of the Hydroelectric power plant with a neat sketch.	5	4	4	2
Q.11	Differentiate between Impulse and Reaction Turbine.	5	2	1	1
	PART - C: (Attempt 3 questions out of 4) Max. Marks (30)				
Q.12	Describe the construction and working of Babcock and Wilcox Boiler.	10	3	3	1
Q.13	Explain the Vapour Compression refrigeration cycle with a neat sketch.	10	4	4	2
Q.14	Describe the construction and working of the Impulse turbine with a sketch.	10	4	3	2
Q. 15	Explain the working of 4 stroke SI engine with P-V and T-S curve.	10	3	3	1





BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analyzing, 5 – Evaluating, 6 - Creating)

CO – Course Outcomes; PO – Program Outcomes

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

B.TECH. (I Semester) **SECOND MID TERM EXAMINATION 2022-23** **Roll No……**

Code: 1FY3-07 Category: PCC Subject Name–BASIC MECHANICAL ENGNEERING (BME)

BRANCH-ALL BRANCH

SET A **Course Credit: 02**

Max. Time: 2 hrs. **Max. Marks: 60**

NOTE:- Read the guidelines given with each part carefully.

Course Outcomes (CO):

At the end of the course the student should be able to:

CO1: Students will be able to retrieve basic concepts of thermal and manufacturing process. (Recall/Remembering).

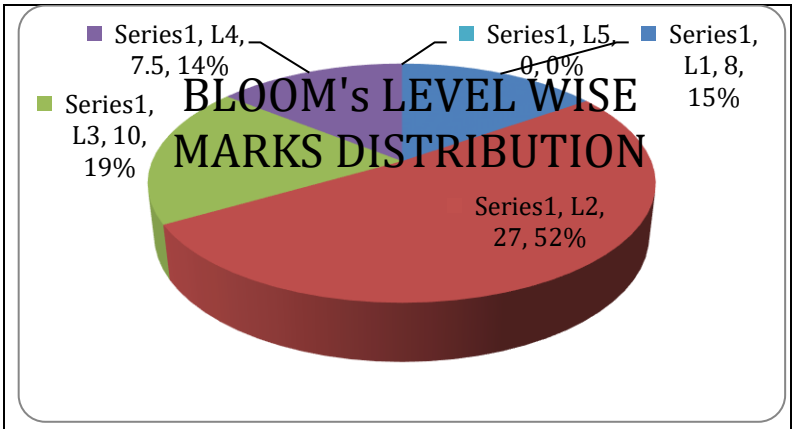
CO2: Students will able to compare different types of thermal and manufacturing processes and. (Understand)

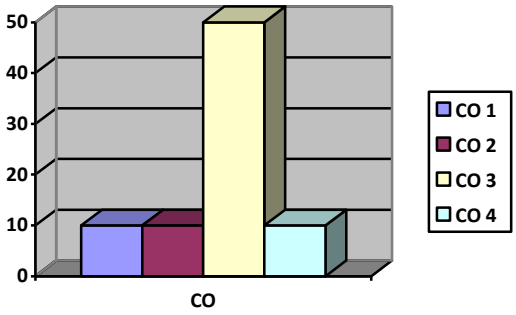
CO3: Students will able to annotating about the functioning of turbine & pumps, IC engines, refrigeration system, modes of transmission of power, materials and primary manufacturing process. (Apply)

CO4: Student will be able to appraise the fundamental knowledge of thermal engineering, in addition to understanding of power transmission to solve the industrial and societal issues. (Examine)

	PART - A: (All questions are compulsory) Max. Marks (10)				
		Marks	**CO**	**BL**	**PO**
Q.1	What is Slip?	**2**	**1**	**1**	**1**
Q.2	Define the term Blow holes in the casting.	**2**	**1**	**1**	**1**
Q.3	Explain Engineering materials briefly.	**2**	**1**	**1**	**1**
Q.4	Define Annealing process.	**2**	**1**	**1**	**1**
Q.5	State the term wire drawing process.	**2**	**1**	**1**	**1**
	PART - B: (Attempt 4 questions out of 6) Max. Marks (20)				
Q.6	What is the difference between the flat belt and v belt drive?	**5**	**2**	**2**	**1**
Q.7	Explain the working of gas welding and also explain different types of flames generated in oxy-acetylene welding with suitable diagrams.	**5**	**3**	**3**	**1**
Q.8	What is the extrusion process? Explain different types of extrusion process with a suitable diagram?	**5**	**3**	**3**	**1**
Q.9	Write down the difference between soldering and brazing.	**5**	**2**	**2**	**1**
Q.10	What is Gear? Explain different types of gear for the transmission of power with a suitable diagram.	**5**	**3**	**3**	**1**
Q.11	Describe the various methods of heat treatment with the help of suitable diagrams.	**5**	**3**	**3**	**1**
	PART - C: (Attempt 3 questions out of 4) Max. Marks (30)				
Q.12	Explain the following with a neat sketch:	**10**	**3**	**3**	**1**

	1. Forging process 2. Rolling process				
Q.13	Explain the various pattern allowances used in the foundry. Also explain different types of Casting defects.	**10**	**3**	**3**	**1**
Q.14	Derive an expression for the length of the open belt derives.	**10**	**3**	**3**	**1**
Q.15	What do you understand by a gear train? 2 kW of power is transmitted by an open belt drive. The linear velocity of belt is 2 m/s. The angle of lap on the smaller pulley is 160^0. The coefficient of friction is 0.25. Determine the effect on power transmission in the following cases: a. Initial tension in the belt is increased by 8% b. Initial tension in the belt is decreased by 8% c. Angle of lap is increased by 8% by the use of an idle pulley for the same speed and the tension on the tight side Coefficient of friction is increased by 8% by suitable dressing to the friction surface of belt.	**10**	**4**	**4**	**2**





BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analyzing, 5 – Evaluating, 6 - Creating)

CO – Course Outcomes; PO – Program Outcomes

5-07-22

I B.TECH. (II Sem.) POORNIMA COLLEGE OF ENGINEERING, JAIPUR Roll No. Sec-H

SECOND MID TERM EXAMINATION 2022-23

Code: 2FY3-07 Category: ESC Subject Name:- BASIC MECHANICAL ENGINEERING (BME)

(SECTION – B, BRANCH - CS)

Max. Time: 2 hrs. Course Credit: 02

NOTE:- Read the guidelines given with each part carefully. Max. Marks: 60

Course Outcomes (CO):

At the end of the course the student should be able to:

CO1: Students will be able to retrieve basic concepts of thermal and manufacturing processes. **(Recall/Remembering)**

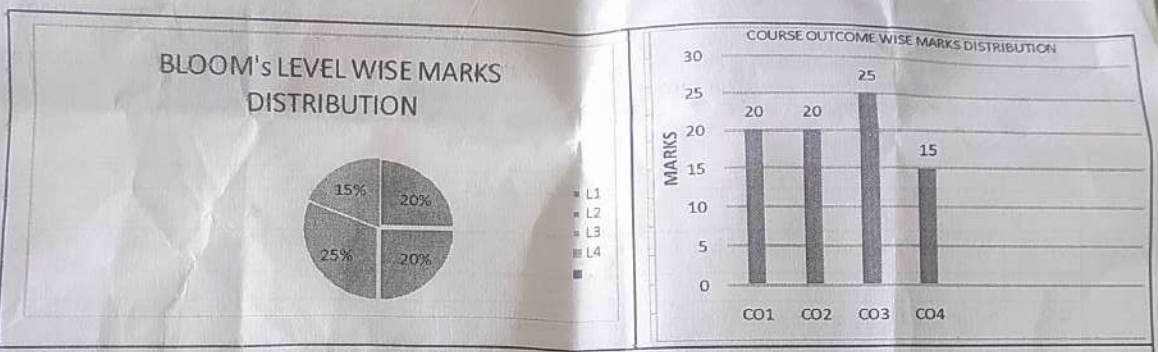
CO2: Students will able to compare different types of thermal and manufacturing processes and. **(Understand)**

CO3: Students will be able to annotating about the functioning of turbine & pumps, IC engines, refrigeration system, modes of transmission of power, materials and primary manufacturing process. **(Apply)**

CO4: Student will be able to appraise the fundamental knowledge of thermal engineering, in addition to understanding of power transmission to solve the industrial and societal issues. **(Examine)**

		Marks	CO	BL	PO
	PART - A: (All questions are compulsory) Max. Marks (10)				
Q.1	What is the velocity ratio of belt drive?	2	CO1	L1	PO1
Q.2	What are the main classifications of stainless steel?	2	CO1	L1	PO1
Q.3	Define Casting process.	2	CO1	L1	PO1
Q.4	What is straight and reverse polarity in the electric arc welding process?	2	CO1	L1	PO1
Q.5	Define Slip and Creep in belt drive.	2	CO1	L1	PO1
	PART - B: (Attempt 4 questions out of 6) Max. Marks (20)				
Q.6	Classify the Engineering materials and explain the application and constituents of some of the important ferrous and non-ferrous materials.	5	CO2	L2	PO1
Q.7	Differentiate between welding, brazing and soldering.	5	CO2	L2	PO1
Q.8	What is Gear? Explain different types of gear for transmission of power with suitable diagrams.	5	CO3	L1	PO2
Q.9	Explain various types of forging operations.	5	CO3	L1	PO2
Q.10	Derive an expression for the length of open belt drives.	5	CO4	L4	PO2
Q.11	Explain the working of gas welding and explain different types of flames generated in oxy-acetylene welding with suitable diagrams.	5	CO3	L2	PO2
	PART - C: (Attempt 3 questions out of 4) Max. Marks (30)				
Q.12	Two pulleys, one 450 mm diameter and the other 200 mm diameter are on parallel shafts 1·95 m apart and are connected by a crossed belt. Find the length of the belt required and the angle of contact between the belt and each pulley. What power can be transmitted by the belt, when the larger pulley rotates at 200 rev/min, if the maximum permissible tension in the belt is 1 KN, and the coefficient of friction between the belt and pulley is 0·25 ?	10	CO4	L4	PO2

Q.13	Describe the various methods of heat treatment with the help of suitable diagrams.	10	CO1	L1	PO1
Q.14	Explain the various pattern allowances used in foundry. Also explain different properties of molding sand.	10	CO3	L3	PO2
Q. 15	Classify different types of power transmission systems.	10	CO2	L2	PO1



BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analyzing, 5 – Evaluating, 6 - Creating)

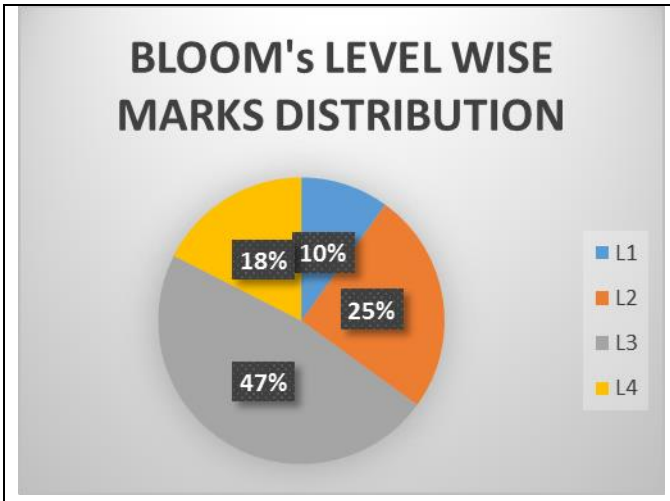
CO – Course Outcomes; PO – Program Outcomes

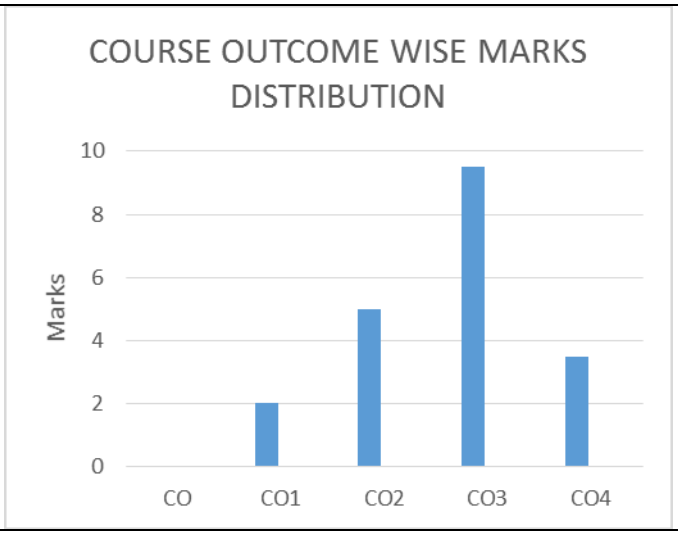
POORNIMA
COLLEGE OF ENGINEERING

Important Question Unit 1

		Marks	CO	BL	PO
Q.1	What is pump? What is priming?	1	CO1	L1	PO1
Q.2	Describe the classification of IC engines?	1	CO1	L1	PO1
Q.3	What are the differences between fire tube and water tube boilers?	1	CO2	L2	PO1
Q.4	What are the differences between impulse and reaction impulse turbine?	2	CO2	L2	PO1
Q.5	State basic difference between 2 stroke and 4 stroke engines.	2	CO2	L2	PO1
Q.6	What are steam boilers? State some applications of steam boilers?	2	CO3	L3	PO1
Q.7	We want to discharge water from lower head to a limited height but we need high discharge, so which type of pump we can use explain with proper working.	2	CO3	L3	PO1
Q.8	What are the main parts of steam turbine? What is the function of steam nozzle?	2	CO3	L3	PO1
Q.9	With the help of neat diagram explain the layout of steam power plant.	3.5	CO3	L3	PO1
Q. 10	An engine working on air standard Otto cycle has a cylinder diameter of	3.5	CO4	L4	PO2

	10 cm and stroke length of 15 cm. The ratio of specific heats for air is 1.4. If the clearance volume is 196.3 cc and the heat supplied per kg of air per cycle is 1800 kJ/kg, then work output per cycle per kg of air is.				





BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analyzing, 5 – Evaluating, 6 - Creating)

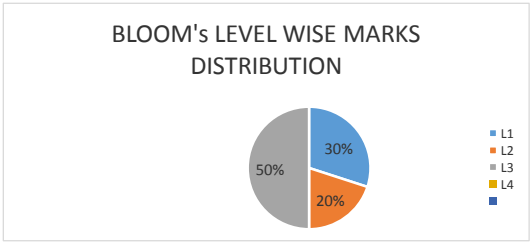
CO – Course Outcomes; PO – Program Outcomes

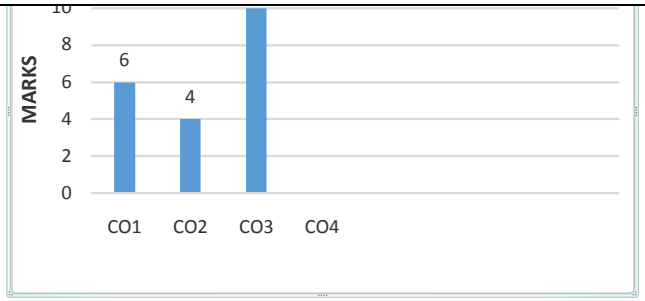
POORNIMA COLLEGE OF ENGINEERING

Important questions Unit 1

		Marks	CO	BL	PO
Q.1	What do you understand by compounding of steam turbine? Explain pressure compounding for two stage impulse steam turbine..	2	CO3	L3	PO1
Q.2	Elaborate laws of thermodynamics and gas laws of thermodynamics.	2	CO1	L1	PO1
Q.3	What are the differences between fire tube and water tube boilers?	2	CO2	L2	PO1
Q.4	Differentiate among the terms open system, closed system and isolated system.	2	CO2	L2	PO1
Q.5	With the help of neat diagram explain the layout of steam power plant.	2	CO3	L3	PO1
Q.6	Explain the working of Locomotive and Cochran boiler with suitable diagram.	2	CO3	L3	PO1
Q.7	Explain the importance of CAD/CAM with some industrial examples.	2	CO3	L3	PO1
Q.8	What are the main parts of steam turbine? What is the function of steam nozzle?	2	CO3	L3	PO1
Q.9	Define mechanical engineering and its scope?	2	CO1	L1	PO1
Q. 10	Explain the working of steam power plant with the suitable	2	CO1	L1	PO1

	diagram.				





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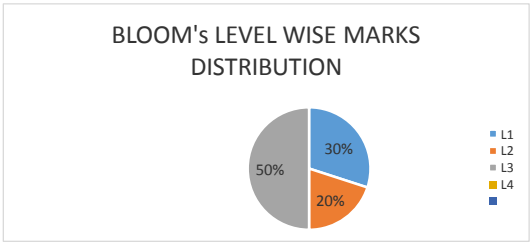
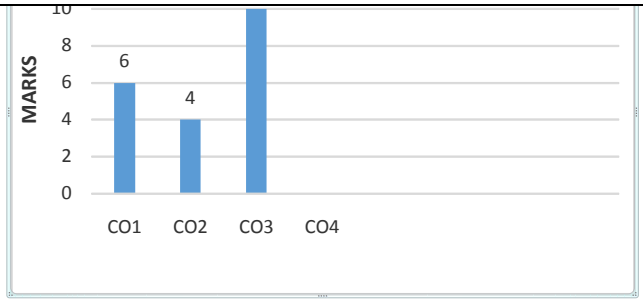
CO – Course Outcomes; PO – Program Outcomes

POORNIMA COLLEGE OF ENGINEERING

Important Question Unit 1

		Marks	CO	BL	PO
Q.1	Write down the difference between fire tube and water tube boiler.	2	CO3	L3	PO1
Q.2	Elaborate laws of thermodynamics and gas laws of thermodynamics.	2	CO1	L1	PO1
Q.3	What is the meant by pressure compounding and velocity compounding?	2	CO2	L2	PO1
Q.4	Explain different types of boiler mountings.	2	CO2	L2	PO1
Q.5	With the help of neat diagram explain the layout of steam power plant.	2	CO3	L3	PO1
Q.6	What is thermodynamic system? Differentiate various types of system in thermodynamics.	2	CO3	L3	PO1
Q.7	Explain the importance of CAD/CAM with some industrial examples.	2	CO3	L3	PO1
Q.8	What are the main parts of steam turbine? What is the function of steam nozzle?	2	CO3	L3	PO1
Q.9	Define mechanical engineering and its scope?	2	CO1	L1	PO1
Q. 10	Explain the working of steam power plant with the suitable diagram.	2	CO1	L1	PO1





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CO – Course Outcomes; PO – Program Outcomes

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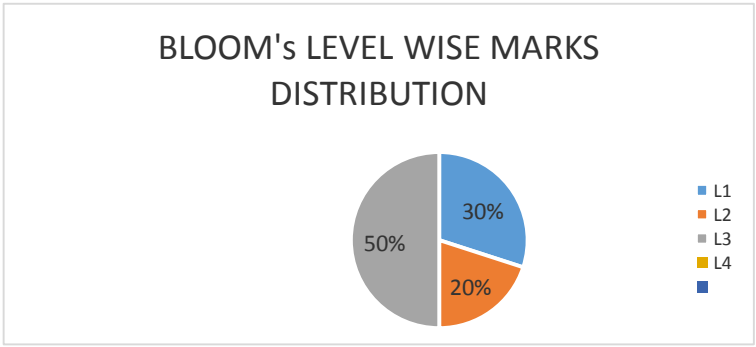
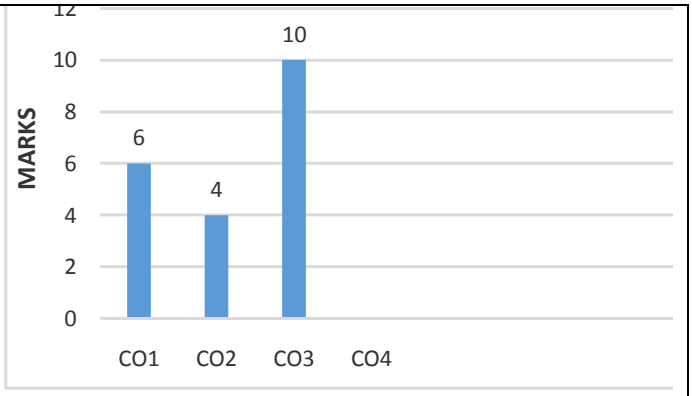
Important Question Unit 2

		Marks	CO	BL	PO
Q.1	Describe the classification of IC engines?	2	**CO3**	**L3**	**PO1**
Q.2	Differences between petrol and diesel engine.	2	**CO2**	**L2**	**PO1**
Q.3	What is compression ratio? Explain the main component of IC engines?	2	**CO3**	**L3**	**PO1**
Q.4	State basic difference between 2 stroke and 4 stroke engines.	2	**CO2**	**L2**	**PO1**
Q.5	What is pump? What is priming?	2	**CO1**	**L1**	**PO1**
Q.6	Explain the specific function of fuel pump and injector in diesel engine	2	**CO3**	**L3**	**PO1**
Q.7	State basic difference between 2 stroke and 4 stroke engines.	2	**CO2**	**L2**	**PO1**
Q.8	Explain the working of reciprocating pumps with neat diagram.	2	**CO3**	**L3**	**PO1**
Q.9	An engine working on air standard Otto cycle has a cylinder diameter of 10 cm and stroke length of 15 cm. The ratio of specific heats for air is 1.4. If the clearance volume is 196.3 cc and the heat supplied per kg of air per cycle is 1800 kJ/kg, then work output per cycle per kg of air is.	2	**CO4**	**L4**	**PO2**
Q. 10	We want to discharge water from lower head to a limited height but we need high discharge, so which type of pump we can use explain with proper working.	2	**CO3**	**L3**	**PO1**





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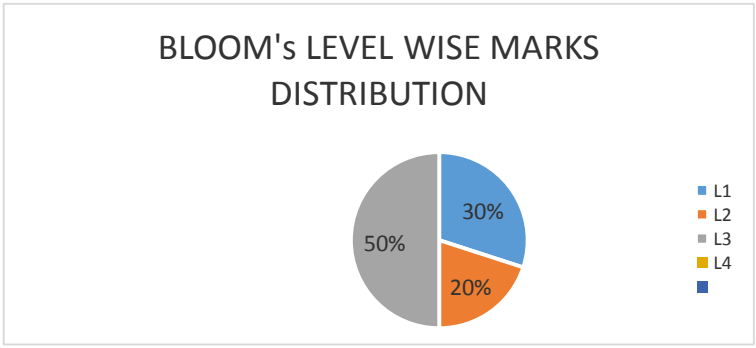
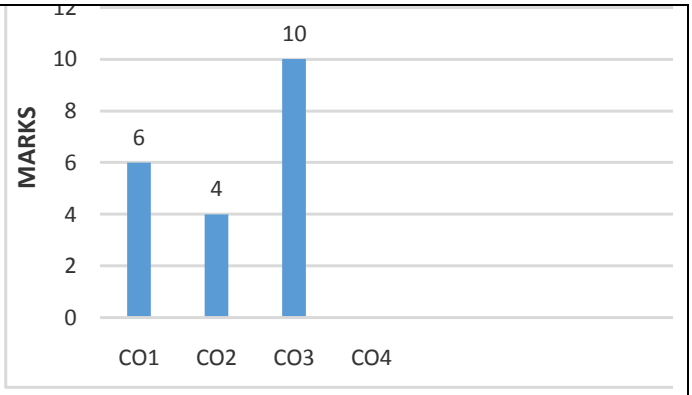
Important questions Unit 2

		Marks	CO	BL	PO
Q.1	What are the functions of carburettor?	2	**CO3**	**L3**	**PO1**
Q.2	Explain different terminology used in internal combustion engines.	2	**CO2**	**L2**	**PO1**
Q.3	Describe the working of 4 stroke SI engine.	2	**CO3**	**L3**	**PO1**
Q.4	Write about performance parameters of IC engine?	2	**CO2**	**L2**	**PO1**
Q.5	What are the functions of Fuel injection system for C.I. engines?	2	**CO1**	**L1**	**PO1**
Q.6	Explain the specific function of fuel pump and injector in diesel engine	2	**CO3**	**L3**	**PO1**
Q.7	Describe water cooling and its differences with air cooling.	2	**CO2**	**L2**	**PO1**
Q.8	What is the use of thermostat valve in the case of radiator cooling system?	2	**CO3**	**L3**	**PO1**
Q.9	What is an air standard cycle/ why such cycles are used?	2	**CO3**	**L3**	**PO3**
Q. 10	Calculate the ideal air standard cycle efficiency based on the Otto cycle in a petrol engine witha cylinder bore of 55mm,a stroke of 80mm,and a clearance volume of 23.3 cm3. Use the information form this compression ratio to calculate :Pressure and temperature at a beginning compression process is 101 kN/m2 and 870C. Temperature at the beginning of an expand process is15020C. Calculate the temperature and pressure at the important points based on the Otto cycle.	2	**CO4**	**L4**	**PO2**





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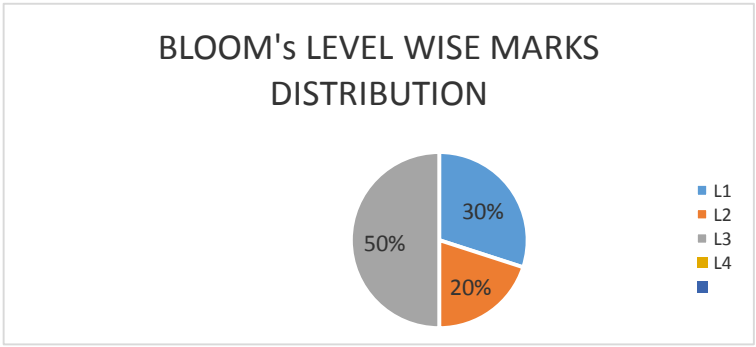

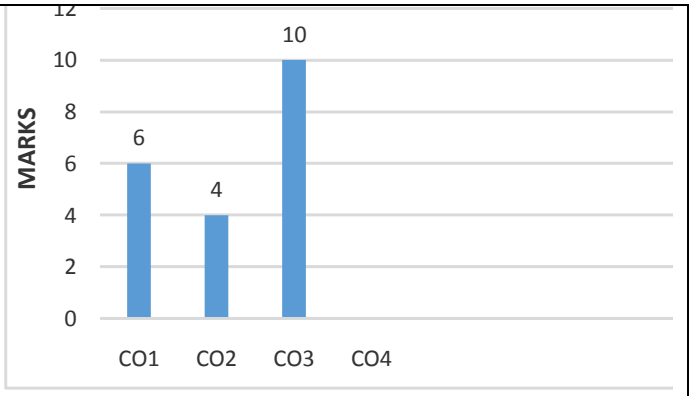

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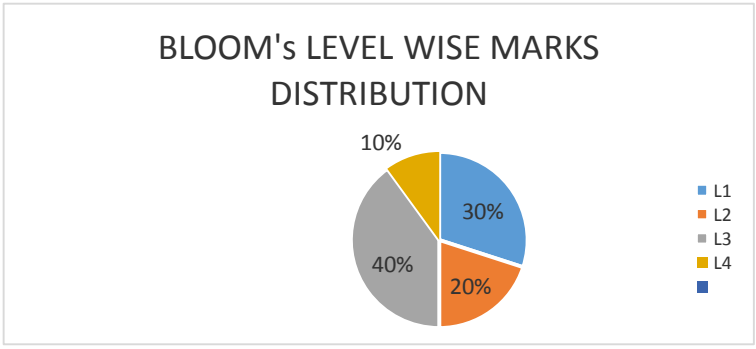
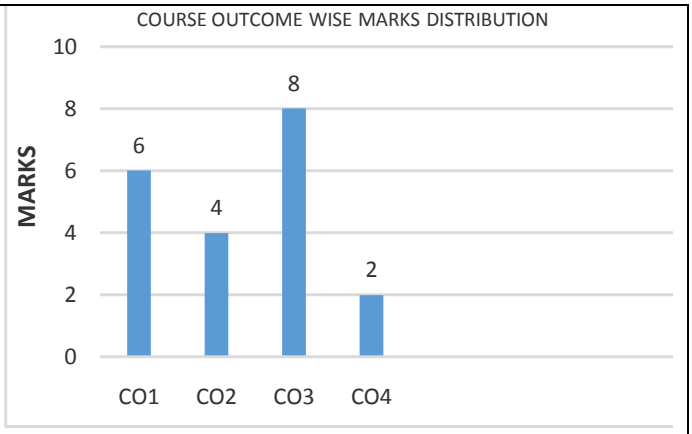
Important questions Unit 3

		Marks	CO	BL	PO
Q.1	With schematic, compare heat engine, heat pump and refrigerating machine	2	CO3	L3	PO1
Q.2	What do you mean by Refrigerant? Explain about various desirable properties of Refrigerants.	2	CO1	L1	PO1
Q.3	Discuss in brief VCRS	2	CO2	L2	PO1
Q.4	What are the advantages of vapour absorption refrigeration system over vapour compression refrigeration system?	2	CO2	L2	PO1
Q.5	Explain vapour absorption refrigeration system.	2	CO1	L1	PO1
Q.6	Write the properties of an ideal refrigerant.	2	CO3	L3	PO1
Q.7	With neat diagram explain the working of refrigerator?	2	CO3	L3	PO1
Q.8	Draw a schematic layout of an air conditioner and explains it's working.	2	CO3	L3	PO1
Q.9	The refrigerating efficiency that is the ratio of actual COP to reversible COP of a refrigeration cycle is 0.8, the condenser and evaporator temperatures are 50°C and –30°C respectively. If cooling capacity of the plant is 2.4 kW then what is the work requirement?	2	CO1	L1	PO1
Q. 10	A heat pump working on a reversed Carnot cycle has a C.O.P. of 5. lf it works as a refrigerator taking 1 kW of work input, What	2	CO4	L4	PO2

	will be the refrigerating effect ?				





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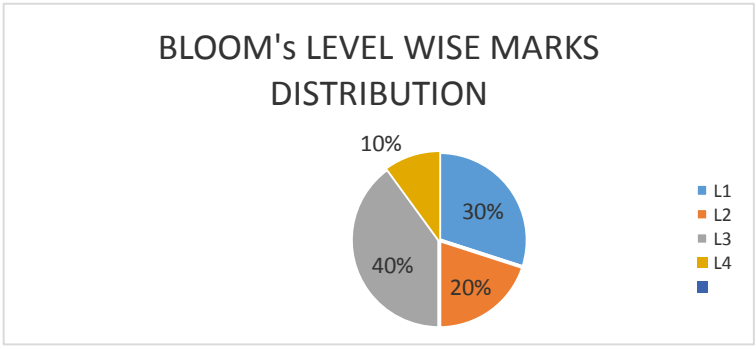
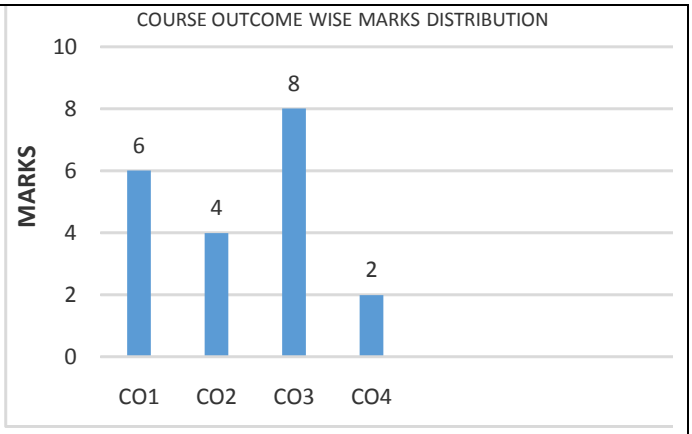
Important Question Unit 3

		Marks	CO	BL	PO
Q.1	Define refrigeration? Define ton of refrigeration	2	**CO3**	**L3**	**PO1**
Q.2	What are refrigerants? Explain desirable properties of refrigerants?	2	**CO1**	**L1**	**PO1**
Q.3	Write down the difference between vapour compression and absorption refrigeration system.	2	**CO2**	**L2**	**PO1**
Q.4	Explain vapour compression refrigeration system with the help of neat diagram?	2	**CO2**	**L2**	**PO1**
Q.5	Explain vapour absorption refrigeration system.	2	**CO1**	**L1**	**PO1**
Q.6	Explain the working principle of window air conditioner?	2	**CO3**	**L3**	**PO1**
Q.7	With neat diagram explain the working of refrigerator?	2	**CO3**	**L3**	**PO1**
Q.8	Draw a schematic layout of an air conditioner and explains it's working.	2	**CO3**	**L3**	**PO1**
Q.9	For heating purposes which kinds of machine we will use explain with suitable line diagram and examples?	2	**CO1**	**L1**	**PO1**
Q. 10	A house hold refrigerator with a C.O.P of 1.8 removes heat from a refrigerated space at a rate of 90 kJ/min. Determine: (1)The electrical power consumed (2) the heat rejected to surrounding.	2	**CO4**	**L4**	**PO2**





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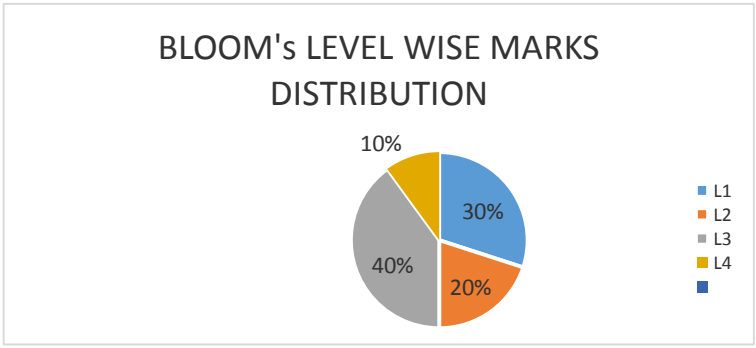
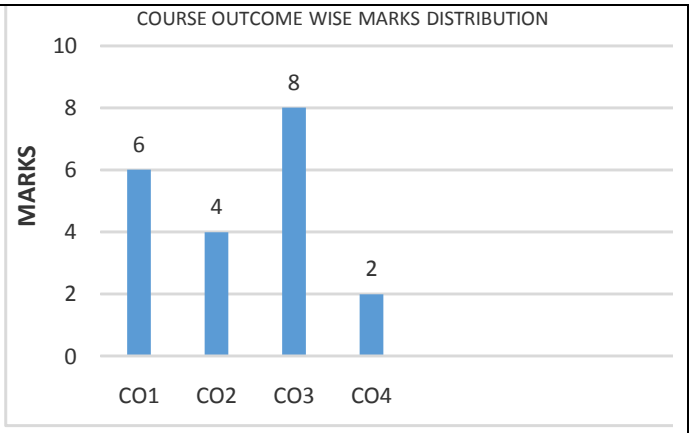
Important questions Unit 3

		Marks	CO	BL	PO
Q.1	Explain the applications of air-conditioning.	2	**CO3**	**L3**	**PO1**
Q.2	•What is meant by dry air, moist air, dry bulb temperature, wet bulb temperature and relative humidity?	2	**CO1**	**L1**	**PO1**
Q.3	Write short note on comfort air conditioning.	2	**CO2**	**L2**	**PO1**
Q.4	Explain following (1) COP for heat pump and refrigerator (2) Unit of refrigeration and how is it defined	2	**CO2**	**L2**	**PO1**
Q.5	Explain vapour absorption refrigeration system.	2	**CO1**	**L1**	**PO1**
Q.6	Write short notes on eco- friendly refrigerants.	2	**CO3**	**L3**	**PO1**
Q.7	With neat diagram explain the working of refrigerator?	2	**CO3**	**L3**	**PO1**
Q.8	Draw a schematic layout of an air conditioner and explains it's working.	2	**CO3**	**L3**	**PO1**
Q.9	What are the advantages and disadvantages of thermo electric cooling?	2	**CO1**	**L1**	**PO1**
Q. 10	A heat pump delivers 10 kW of heat to a room maintained at 250 C and receives heat from reservoir at -100 C. If the actual coefficient of performance is 50% of that of an ideal heat pump operating between the same temperature limits, what is the actual power required in kW to run the heat pump..	2	**CO4**	**L4**	**PO2**





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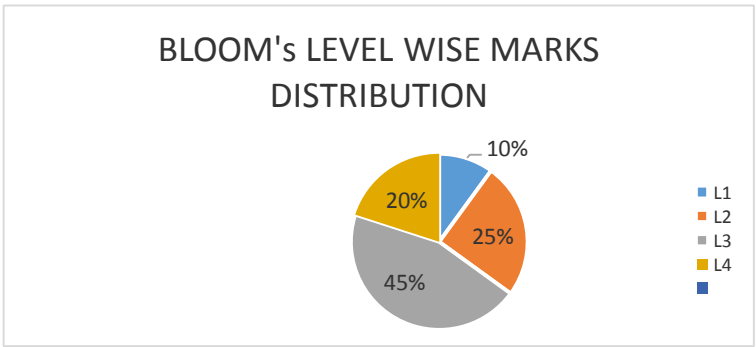
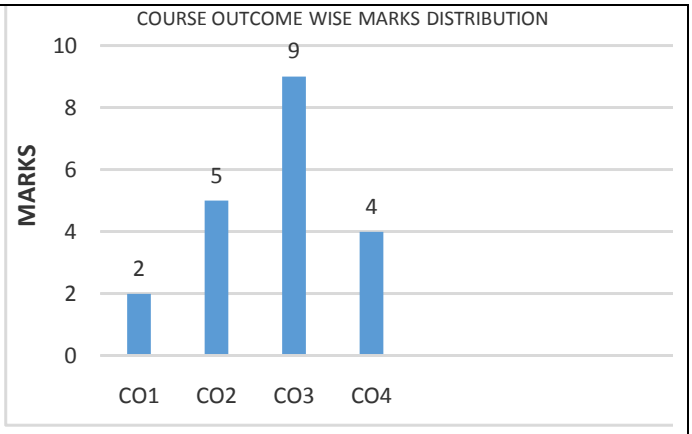
Important questions Unit 4

		Marks	CO	BL	PO
Q.1	Explain the open belt and cross belt drives	1	**CO1**	**L1**	**PO1**
Q.2	List the methods to reduce the slip in belt and pulley	1	**CO1**	**L1**	**PO1**
Q.3	Explain ratio of friction tensions, centrifugal tension in a belt	1	**CO2**	**L2**	**PO1**
Q.4	What is Gear? Explain different types of gear for transmission of power with suitable diagram	2	**CO3**	**L1**	**PO1**
Q.5	Derive an expression for the length of open belt derives.	3	**CO3**	**L3**	**PO1**
Q.6	State the types of chains & sprockets.	2	**CO2**	**L2**	**PO1**
Q.7	What are the advantages of 'V' belt drive over flat belt drive ?.	2	**CO2**	**L2**	**PO1**
Q.8	Classify different types of power transmission system.	2	**CO3**	**L3**	**PO1**
Q.9	A belt is running over a pulley of diameter 100 cm at 300 rpm. The angle of contact is 150o and coefficient of friction between the belt and the pulley is 0.3. If the maximum tension in the belt is 3000N, find the power transmitted by the belt	4	**CO4**	**L4**	**PO2**
Q. 10	Explain power transmitted by belts and ropes	2	**CO3**	**L1**	**PO1**





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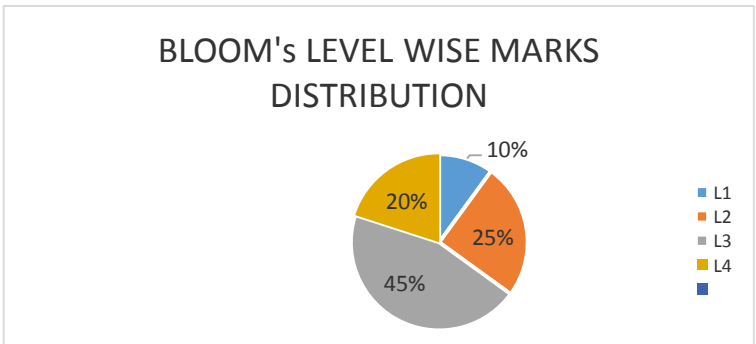
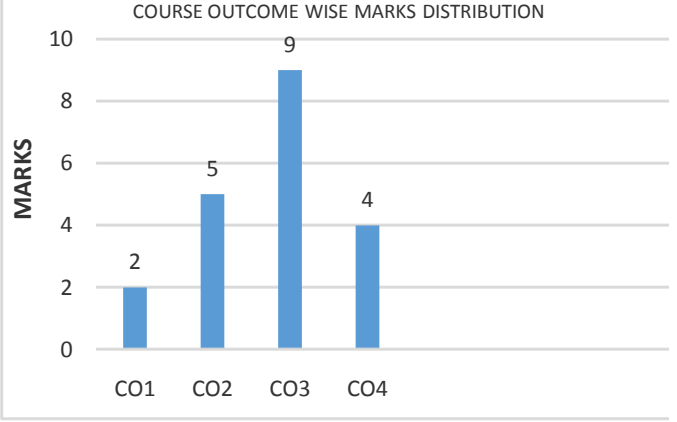
Important Question Unit 4

		Marks	CO	BL	PO
Q.1	What is slip?	1	CO1	L1	PO1
Q.2	Explain the velocity ratio of belt drive with the consideration of slip.	1	CO1	L1	PO1
Q.3	Why gear drives are known as positive power transmission drive?	1	CO2	L2	PO1
Q.4	What is Gear? Explain different types of gear for transmission of power with suitable diagram.	2	CO3	L1	PO1
Q.5	Derive an expression for the length of open belt derives.	3	CO3	L3	PO1
Q.6	Write down the difference between flat belt and v belt drive	2	CO2	L2	PO1
Q.7	Difference between Slip and creep.	2	CO2	L2	PO1
Q.8	Classify different types of power transmission system.	2	CO3	L3	PO1
Q.9	Two pulleys, one 450 mm diameter and the other 200 mm diameter are on parallel shafts 1·95 m apart and are connected by a crossed belt. Find the length of the belt required and the angle of contact between the belt and each pulley. What power can be transmitted by the belt, when the larger pulley rotates at 200 rev/min, if the maximum permissible tension in the belt is 1 KN, and the coefficient of friction between the belt and pulley is 0·25 ?	4	CO4	L4	PO2
Q. 10	You want to transfer a power upto 15 meter which power transmission drive you will adopt. Explain with the suitable diagram.	2	CO3	L1	PO1





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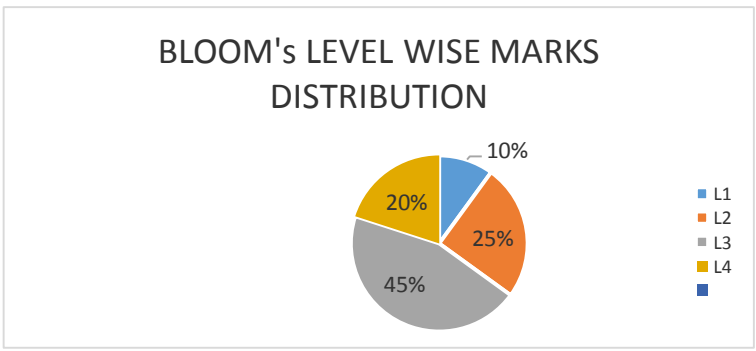
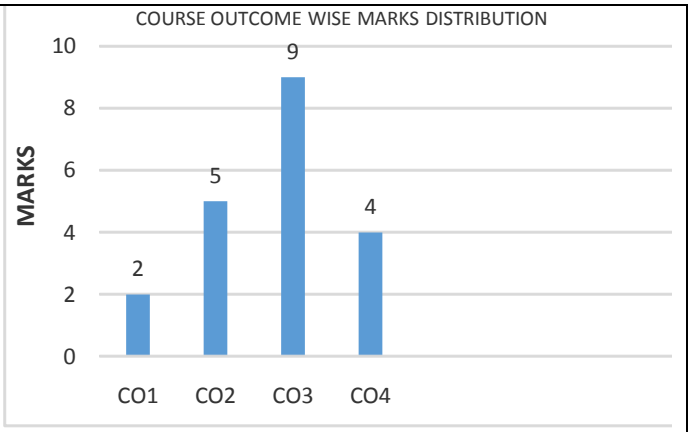
Important questions Unit 4

		Marks	CO	BL	PO
Q.1	How are drives classified?	1	**CO1**	**L1**	**PO1**
Q.2	Compare cross belt drive and open belt drive on the basis of: (i) Velocity ratio. (ii) Direction of driven pulley. (iii) Length of belt drives (iv) Application.	1	**CO1**	**L1**	**PO1**
Q.3	Explain steep and creep phenomenon in belts.	1	**CO2**	**L2**	**PO1**
Q.4	State the type of power transmission chains. Describe any one with its sketch	2	**CO3**	**L1**	**PO1**
Q.5	Define 'Gear Train'. State its purpose and types of gear train..	3	**CO3**	**L3**	**PO1**
Q.6	State the types of chains & sprockets.	2	**CO2**	**L2**	**PO1**
Q.7	What are the advantages of 'V' belt drive over flat belt drive ?.	2	**CO2**	**L2**	**PO1**
Q.8	Generally, the lower side is kept "Tight side" and upper side is kept as "Slack side" with the belt drives having small driving pulley and big driven pulley. Why ?	2	**CO3**	**L3**	**PO1**
Q.9	Find the width of the belt, necessary to transmit 7.5 kW to a pulley 300 mm diameter, if the pulley makes 1600 rpm and the co-efficient of friction between the belt and pulley is 0.3. Assume the angle of contact as 180o and the maximum tension in the belt is not to exceed 8 N/mm width.	4	**CO4**	**L4**	**PO2**
Q. 10	State types of gear train and explain any one.	2	**CO3**	**L1**	**PO1**





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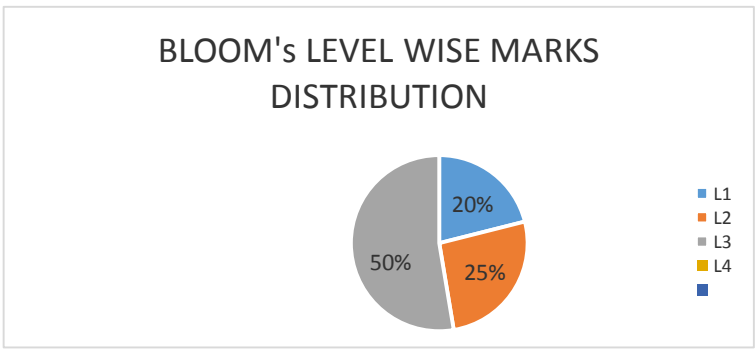
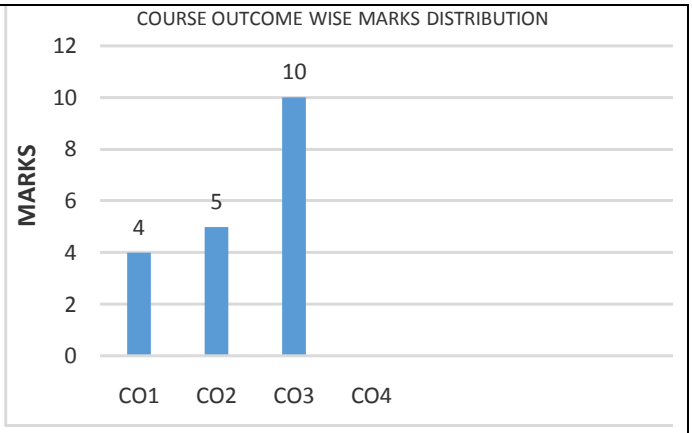
Important Question Unit 5, 6

			CO	BL	PO
Q.1	What is the effect of adding nickel and vanadium to steel?	2	CO1	L1	PO1
Q.2	What is engineering materials?	2	CO1	L1	PO1
Q.3	Classify the Engineering materials and explain the application and constituents of some of the important ferrous and non-ferrous materials.	2	CO2	L2	PO1
Q.4	Write down the difference between soldering and brazing.	2	CO2	L2	PO1
Q.5	Explain different properties of molding sand.	2	CO3	L3	PO1
Q.6	Explain the working of gas welding and explain different types of flames generated in oxy-acetylene welding with suitable diagram.	2	CO3	L3	PO1
Q.7	Explain different type of extrusion process.	2	CO3	L3	PO1
Q.8	Describe the various methods of heat treatment with the help of suitable diagram.	2	CO3	L3	PO1
Q.9	Explain the various pattern allowances used in foundry. Also explain different properties of molding sand.	2	CO3	L3	PO1
Q. 10	Suppose you want to manufacture a aluminum engine which manufacturing process you will adopt and why?	2	CO2	L2	PO1





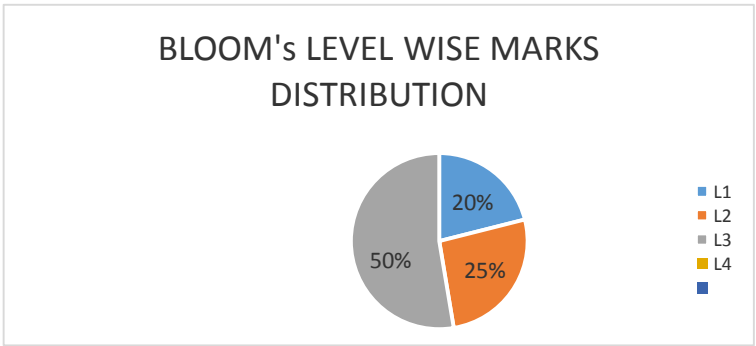
BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analyzing, 5 – Evaluating, 6 - Creating)

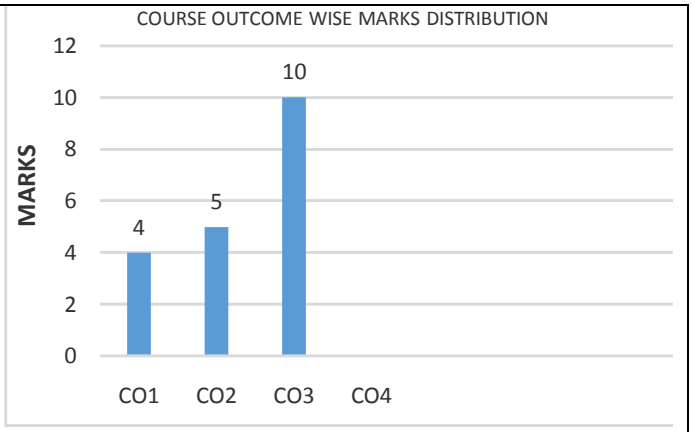
CO – Course Outcomes; PO – Program Outcomes

POORNIMA COLLEGE OF ENGINEERING

Important questions Unit 5, 6

			CO	BL	PO
Q.1	Enumerate some common casting defects and explain the reasons which cause these defects	2	CO1	L1	PO1
Q.2	Distinguish between welding, brazing and soldering. Which process produces the strongest joints and why?	2	CO1	L1	PO1
Q.3	What role has been played by materials in raising the standard of living of mankind?	2	CO2	L2	PO1
Q.4	What do you understand by forging? What are the advantages?	2	CO2	L2	PO1
Q.5	What are melting furnaces? Briefly describe a) Electric arc furnace b) induction furnace	2	CO3	L3	PO1
Q.6	Classify the Engineering materials and explain the application and constituents of some of the important ferrous and non-ferrous materials.	2	CO3	L3	PO1
Q.7	What is a Composite materials? Give some examples	2	CO3	L3	PO1
Q.8	What are the requisite properties in a good foundry sand?	2	CO3	L3	PO1
Q.9	Write and Explain different types of flames generated in ox acetylene welding with suitable diagram.	2	CO3	L3	PO1
Q. 10	Differentiate between brazing and soldering. Describe these Processes with their applications?	2	CO2	L2	PO1





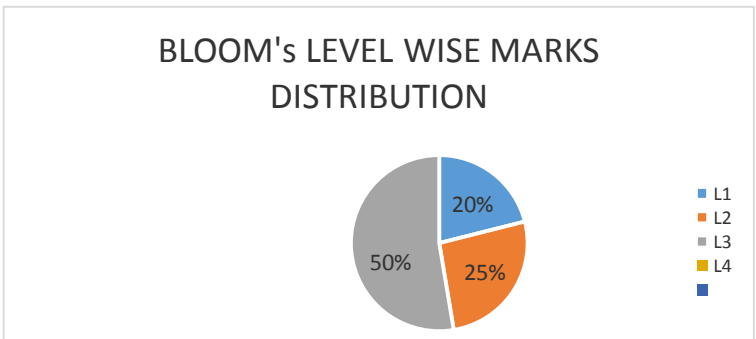
BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analyzing, 5 – Evaluating, 6 - Creating)

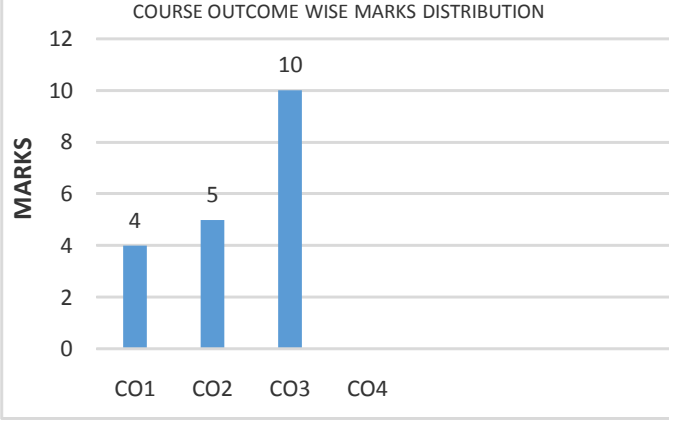
CO – Course Outcomes; PO – Program Outcomes

POORNIMA COLLEGE OF ENGINEERING

Important questions Unit 5, 6

			CO	BL	PO
Q.1	Describe the various methods of heat treatment with the help of suitable diagram	2	CO1	L1	PO1
Q.2	Explain the working of Electric arc welding with a neat diagram	2	CO1	L1	PO1
Q.3	write the composite materials and advantages of composites in aerospace structure	2	CO2	L2	PO1
Q.4	What is welding? How is it classified?	2	CO2	L2	PO1
Q.5	Enumerate some common casting defects and explain the reasons which cause these defects.	2	CO3	L3	PO1
Q.6	Classify the Engineering materials and explain the application and constituents of some of the important ferrous and non-ferrous materials.	2	CO3	L3	PO1
Q.7	Write a note about importance of manufacturing in modern society.	2	CO3	L3	PO1
Q.8	What is a pattern? Name the various allowances associated with patterns and why are they provided?	2	CO3	L3	PO1
Q.9	Write and Explain different types of flames generated in ox acetylene welding with suitable diagram.	2	CO3	L3	PO1
Q. 10	What are the main factors in choosing a material for a particular application?	2	CO2	L2	PO1





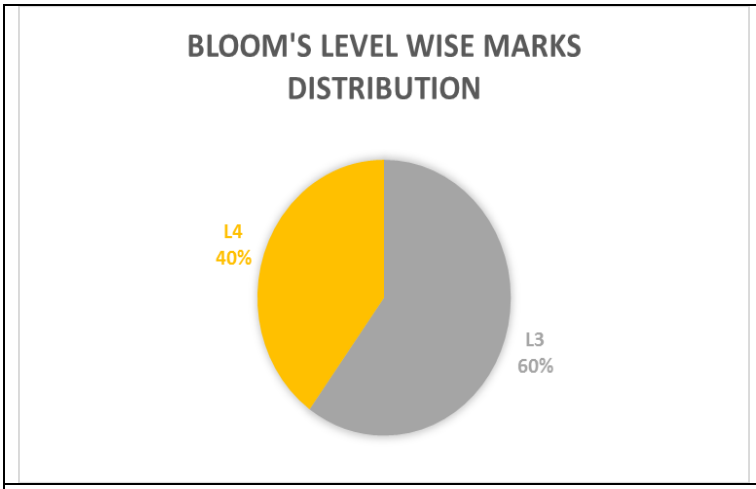
BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analyzing, 5 – Evaluating, 6 - Creating)

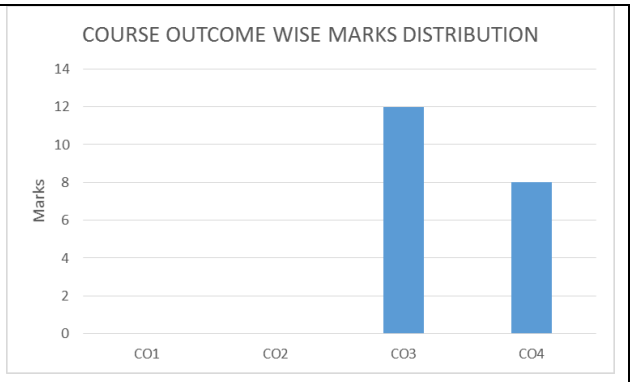
CO – Course Outcomes; PO – Program Outcomes

POORNIMA COLLEGE OF ENGINEERING

Important question

	Question	Marks	CO	PO
Q.1	Explain the working of steam power plant with the suitable diagram.	**4**	**CO3**	**PO1**
Q.2	Explain with neat sketch the working of refrigeration system with industrial applications.	**4**	**CO3**	**PO1**
Q.3	Explain the working of working of Reciprocating and Centrifugal pumps with industrial application.	**4**	**CO3**	**PO1**
Q.4	An engine working on air standard Otto cycle has a cylinder diameter of 10 cm and stroke length of 15 cm. The ratio of specific heats for air is 1.4. If the clearance volume is 196.3 cc and the heat supplied per kg of air per cycle is 1800 kJ/kg, then work output per cycle per kg of air is.	**4**	**CO4**	**PO2**
Q.5	A house hold refrigerator with a C.O.P of 1.8 removes heat from a refrigerated space at a rate of 90 kJ/min. Determine: (1)The electrical power consumed (2) the heat rejected to surrounding.	**4**	**CO4**	**PO2**





BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 –

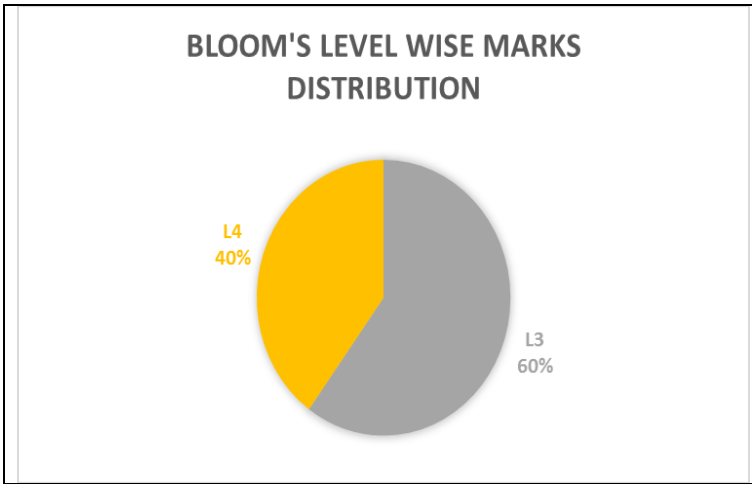
Analyzing, 5 – Evaluating, 6 - Creating)

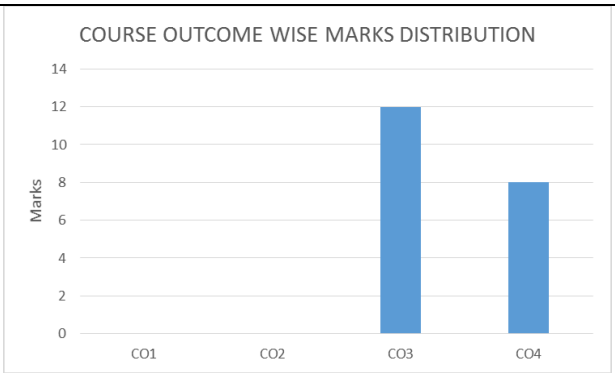
CO – Course Outcomes; PO – Program Outcomes

POORNIMA
COLLEGE OF ENGINEERING

Important Question

	QUESTION	Marks	CO	PO
Q1	What do you understand by a gear train? 2 kW of power is transmitted by an open belt drive. The linear velocity of belt is 2 m/s. The angle of lap on the smaller pulley is 160^0. The coefficient of friction is 0.25. Determine the effect on power transmission in the following cases: a. Initial tension in the belt is increased by 8% b. Initial tension in the belt is decreased by 8% c. Angle of lap is increased by 8% by the use of an idle pulley for the same speed and the tension on the tight side d. Coefficient of friction is increased by 8% by suitable dressing to the friction surface of belt.	**4**	**CO4**	**PO2**
Q2	Find the power transmitted by a belt running over a pulley of 60 cm diameter at 200 r.p.m. The coefficient of friction between the belt and pulley is 0.25, angle of lap is 160^0 and maximum tension in the belt is 2500 N.	**4**	**CO4**	**PO2**
Q3	What is the brazing and soldering process of metal joining? Explain briefly. What is arc welding? Describe the working principle of arc welding with neat diagram?	**4**	**CO3**	**PO1**
Q4	What is extrusion process? Explain different type's extrusion process with suitable diagram?	**4**	**CO3**	**PO1**
Q5	Define engineering material? Explain working of cupola furnace with neat and clean diagram?	**4**	**CO3**	**PO1**





BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 –

Analyzing, 5 – Evaluating, 6 - Creating)

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POORNIMA COLLEGE OF ENGINEERING, JAIPUR

B.TECH. (I Semester) **Roll No……**

I MID TERM EXAMINATION 2022-23

Code: 1FY3-07 Category: PCC Subject Name–BASIC MECHANICAL ENGINEERING (BME)

Course Credit: 02

Max. Time: 2 hrs. **Max. Marks: 60**

NOTE:- Read the guidelines given with each part carefully.

Course Outcomes (CO):

At the end of the course the student should be able to:

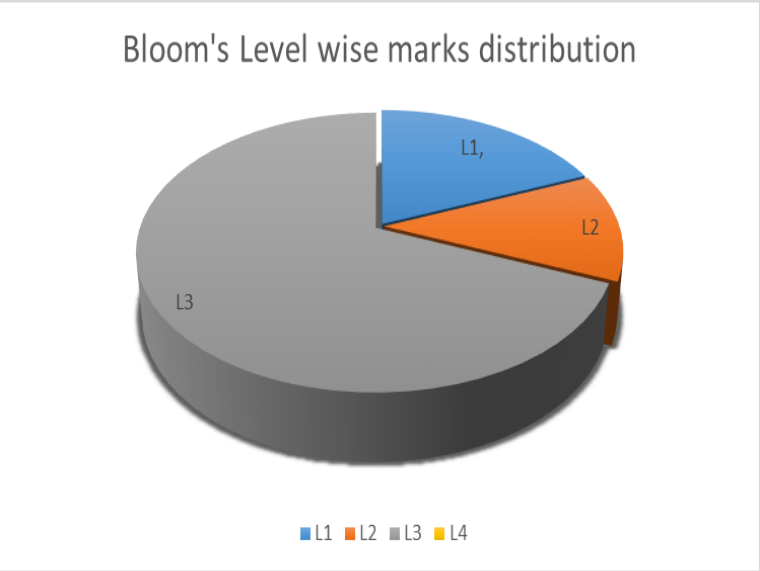
CO1: Students will be able to retrieve basic concepts of thermal and manufacturing processes. **(Recall/Remembering)**

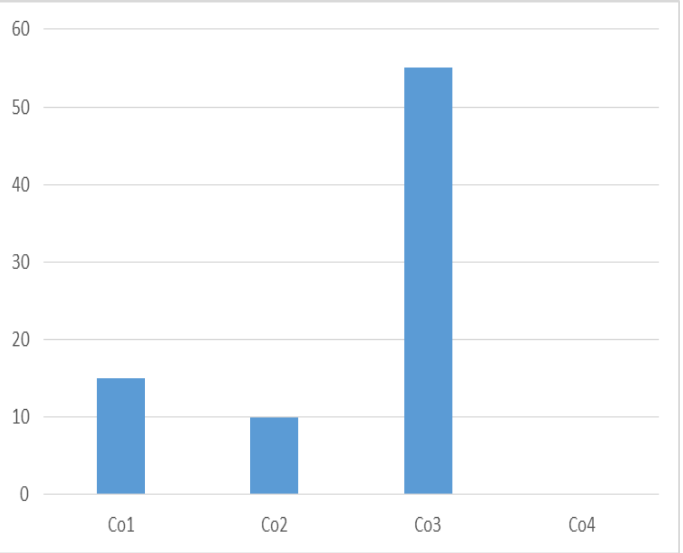
CO2: Students will able to compare different types of thermal and manufacturing processes and. **(Understand)**

CO3: Students will be able to annotate about the functioning of turbine & pumps, IC engines, refrigeration system, modes of transmission of power, materials and primary manufacturing process. **(Apply)**

CO4: Students will be able to appraise the fundamental knowledge of thermal engineering, in addition to understanding of power transmission to solve the industrial and societal issues. **(Examine)**

	PART - A: (All questions are compulsory) Max. Marks (10)				
		Marks	**CO**	**BL**	**PO**
Q.1	Explain the term thermodynamics briefly.	**2**	**1**	**1**	**1**
Q.2	Give the definition of the fire tube boiler.	**2**	**1**	**1**	**1**
Q.3	Define the term manufacturing technology.	**2**	**1**	**1**	**1**
Q.4	State the term “one ton of refrigeration”.	**2**	**1**	**1**	**1**
Q.5	What do you mean by the coefficient of performance (COP) of a refrigerator?	**2**	**1**	**1**	**1**
	PART - B: (Attempt 4 questions out of 6) Max. Marks (20)				
Q.6	What are refrigerants? Explain the desirable properties of a refrigerant.	**5**	**1**	**1**	**1**
Q.7	Explain the working principle of window air conditioner with suitable sketch.	**5**	**3**	**3**	**1**
Q.8	Write down the difference between two strokes SI and CI Engine.	**5**	**2**	**2**	**1**
Q.9	Explain the importance of industrial engineering with some industrial examples.	**5**	**3**	**3**	**1**
Q.10	Differentiate among the terms open system, closed system and isolated system.	**5**	**2**	**2**	**1**
Q.11	How would you classify the internal combustion engines?	**5**	**3**	**3**	**1**
	PART - C: (Attempt 3 questions out of 4) Max. Marks (30)				
Q.12	Explain the air-conditioning in the refrigeration and air-conditioning system. Why is it important in the concern of human comfort?	**10**	**3**	**3**	**1**
Q.13	Describe the working diesel power plant with the help of neat diagram.	**10**	**3**	**3**	**1**
Q.14	Explain the working of a four stroke diesel engine with the help of a suitable diagram?	**10**	**3**	**3**	**1**
Q.15	What do you understand by compounding of steam turbines? Explain pressure compounding for two stage impulse steam turbines.	**10**	**3**	**3**	**1**





BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analyzing, 5 – Evaluating, 6 - Creating)

CO – Course Outcomes; PO – Program Outcomes

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

B.TECH. (I Semester) **SECOND MID TERM EXAMINATION 2022-23** **Roll No……**

Code: 1FY3-07 Category: PCC Subject Name–BASIC MECHANICAL ENGNEERING (BME)

BRANCH-ALL BRANCH

SET A **Course Credit: 02**

Max. Time: 2 hrs. **Max. Marks: 60**

NOTE:- Read the guidelines given with each part carefully.

Course Outcomes (CO):

At the end of the course the student should be able to:

CO1: Students will be able to retrieve basic concepts of thermal and manufacturing process. (Recall/Remembering).

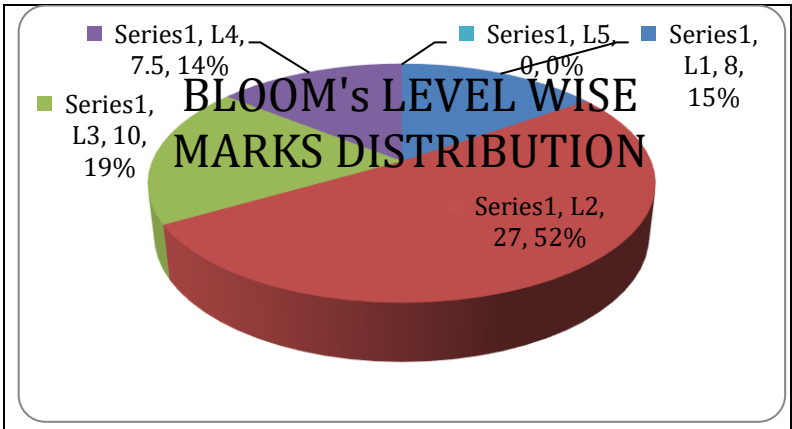
CO2: Students will able to compare different types of thermal and manufacturing processes and. (Understand)

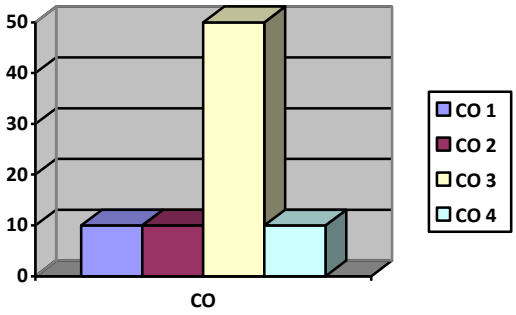
CO3: Students will able to annotating about the functioning of turbine & pumps, IC engines, refrigeration system, modes of transmission of power, materials and primary manufacturing process. (Apply)

CO4: Student will be able to appraise the fundamental knowledge of thermal engineering, in addition to understanding of power transmission to solve the industrial and societal issues. (Examine)

	PART - A: (All questions are compulsory) Max. Marks (10)				
		Marks	**CO**	**BL**	**PO**
Q.1	What is Slip?	**2**	**1**	**1**	**1**
Q.2	Define the term Blow holes in the casting.	**2**	**1**	**1**	**1**
Q.3	Explain Engineering materials briefly.	**2**	**1**	**1**	**1**
Q.4	Define Annealing process.	**2**	**1**	**1**	**1**
Q.5	State the term wire drawing process.	**2**	**1**	**1**	**1**
	PART - B: (Attempt 4 questions out of 6) Max. Marks (20)				
Q.6	What is the difference between the flat belt and v belt drive?	**5**	**2**	**2**	**1**
Q.7	Explain the working of gas welding and also explain different types of flames generated in oxy-acetylene welding with suitable diagrams.	**5**	**3**	**3**	**1**
Q.8	What is the extrusion process? Explain different types of extrusion process with a suitable diagram?	**5**	**3**	**3**	**1**
Q.9	Write down the difference between soldering and brazing.	**5**	**2**	**2**	**1**
Q.10	What is Gear? Explain different types of gear for the transmission of power with a suitable diagram.	**5**	**3**	**3**	**1**
Q.11	Describe the various methods of heat treatment with the help of suitable diagrams.	**5**	**3**	**3**	**1**
	PART - C: (Attempt 3 questions out of 4) Max. Marks (30)				
Q.12	Explain the following with a neat sketch:	**10**	**3**	**3**	**1**

	1. Forging process 2. Rolling process				
Q.13	Explain the various pattern allowances used in the foundry. Also explain different types of Casting defects.	**10**	**3**	**3**	**1**
Q.14	Derive an expression for the length of the open belt derives.	**10**	**3**	**3**	**1**
Q.15	What do you understand by a gear train? 2 kW of power is transmitted by an open belt drive. The linear velocity of belt is 2 m/s. The angle of lap on the smaller pulley is 160^0. The coefficient of friction is 0.25. Determine the effect on power transmission in the following cases: a. Initial tension in the belt is increased by 8% b. Initial tension in the belt is decreased by 8% c. Angle of lap is increased by 8% by the use of an idle pulley for the same speed and the tension on the tight side Coefficient of friction is increased by 8% by suitable dressing to the friction surface of belt.	**10**	**4**	**4**	**2**





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CO – Course Outcomes; PO – Program Outcomes

1E3107

Roll No. 22EPCCS198 Total No. of Pages: 2

1E3107

B. Tech. I - Sem. (Main / Back) Exam., - 2023

1FY3 – 07 Basic Mechanical Engineering

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 Describe Law of Thermodynamics?

Q.2 Describe with figure different type of belt drive.

Q.3 Define the coefficient of performance of Refrigerator.

Q.4 What is the pattern in casting process?

Q.5 What is industrial engineering & its scope?

Q.6 Differentiate between water tube and fire tube boiler?

Q.7 Write a short note on different type of power plants.

realme Shot by Shivam singh

Q.8 What is the IP & BP in the Internal Combustion Engine?

Q.9 Describe modern tools used in Mechanical Engineering.

Q.10 Differentiate between impulse and reaction turbine?

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Explain any one type of water tube boiler with neat sketch.

Q.2 Explain differentiate between 2 stroke & 4 stroke engine.

Q.3 How Cavitation can be eliminated by Pump?

Q.4 Describe with figure different types of belt drive?

Q.5 What is air conditioning? Draw and describe different component used in it.

Q.6 Explain the various stages of Heat treatment process?

Q.7 Write short notes on –

(i) Forging

(ii) Drawing

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 What is meant by refrigeration system? Describe vapor compression refrigeration system?

Q.2 What is gear transmission? Describe different types of gear.

Q.3 Describe rolling process with neat sketches.

Q.4 With a suitable sketch explain the working of centrifugal pump.

Q.5 Describe hardening and tempering of steel.

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I B.TECH. (I Sem.) **Roll No. _____**

SECOND MID TERM EXAMINATION 2018-19
Code: 1FY3-07 Category: ESC Subject Name–BASIC MECHANICAL ENGINEERING
(BRANCH – ALL BRANCHES)

Max. Time: 2 hrs. **Max. Marks: 40**

NOTE:- Read the guidelines given with each part carefully.

PART - A: (All questions are compulsory) Max. Marks (5)

Q.1	What is speed ratio of belt drive? Define with formula.	**(1)**
Q.2	What is forming process?	**(1)**
Q.3	Define the principle of GAS Welding.	**(1)**
Q.4	What is the effect of adding chromium to steel?	**(1)**
Q.5	What is pattern and moulding?	**(1)**

PART - B: (Attempt 4 questions out of 6) Max. Marks (20)

Q.6	Explain the physical and mechanical properties of metals.	**(5)**
Q.7	Explain the difference between forward and backward extrusion with suitable sketch.	**(5)**
Q.8	What are gears? State its types, advantages and disadvantages.	**(5)**
Q.9	Describe the working of Cupola furnace with diagram.	**(5)**
Q.10	Describe the major constituents of the different types of copper alloys.	**(5)**
Q.11	Explain the different operations in forging and rolling process.	**(5)**

PART - C: (Attempt 2 questions out of 3) Max. Marks (15)

Q.12	Differentiate between welding, brazing and soldering. Describe these processes with their applications.	**(7.5)**
Q.13	An open belt drive the engine shaft running at 300 RPM is required to drive a machine shaft by means of a belt. The pulley on the engine shaft is of 2m in diameter and that of the machine shaft is of 1m. If the distance between engine shaft and machine shaft is 5m and belt thickness is 5mm, find the speed of the belt when: a) There is no slip. b) There is a slip of 2% c) Total length of belt.	**(7.5)**
Q.14	Explain following: a) Various patterns allowances used in foundry b) Properties of molding send	**(4)** **(3.5)**

I B.TECH. (I Sem.) **Roll No. _____**

FIRST MID TERM EXAMINATION 2018-19
Code: 1FY3-07 Category: ESC Subject Name–BASIC MECHANICAL ENGINEERING
(BRANCH – ALL BRANCHES)

Max. Time: 2 hrs. **Max. Marks: 40**

NOTE:- Read the guidelines given with each part carefully.

PART - A: (All questions are compulsory) Max. Marks (5)

Q.1	Define thermodynamics. Explain open system, closed system and isolated system.	**(1)**
Q.2	What are the aims of preheating of air in the boilers?	**(1)**
Q.3	What is priming in Centrifugal Pump?	**(1)**
Q.4	What is the function of Flywheel in IC engines?	**(1)**
Q.5	Define Ton of Refrigeration.	**(1)**

PART - B: (Attempt 4 questions out of 6) Max. Marks (20)

Q.6	Define and differentiate fire tube and water tube boilers.	**(5)**
Q.7	Explain the working of reciprocating pumps with neat diagram.	**(5)**
Q.8	Describe the working of Reaction turbine with neat sketch.	**(5)**
Q.9	Explain the working of four stroke petrol with neat sketch.	**(5)**
Q.10	Describe the working of Solar Power plant.	**(5)**
Q.11	Explain Vapour Compression refrigeration system with the help of neat diagram?	**(5)**

PART - C: (Attempt 2 questions out of 3) Max. Marks (15)

Q.12	With the help of neat diagram explain the working of Lancashire boiler. What are its advantages?	**(7.5)**
Q.13	Describe- a. compounding of impulse steam turbine b. Nuclear Reactor c. Two stroke petrol engine	**(7.5)**
Q.14	Explain the working of an Air Refrigerator with the help of layout sketch.	**(7.5)**

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

I B.TECH. (I Sem.) **Roll No. _____**

SECOND MID TERM EXAMINATION 2019-20
Code: IFY3-07 Subject Name–Basic of Mechanical Engineering
(BRANCH –CS & IT)

Max. Time: 2 hrs. **Max. Marks: 40**

NOTE:- Read the guidelines given with each part carefully.

PART - A: (All questions are compulsory) Max. Marks (5)

Q.1	**CO 1**	Define Ton of Refrigeration.	**(1)**
Q.2	**CO 1**	Write the difference between Slip and creep in belt drive.	**(1)**
Q.3	**CO 1**	What is the effect of adding chromium to steel?	**(1)**
Q.4	**CO 1**	What is pattern and moulding?	**(1)**
Q.5	**CO 1**	Name the different flames obtained in Oxy-acetylene welding.	**(1)**

PART - B: (Attempt 4 questions out of 6) Max. Marks (20)

Q.6	**CO 2**	What is Gear? What are the different types of gears used in power transmission?	**(5)**
Q.7	**CO 2**	Classify engineering materials and discuss various properties of engineering materials.	**(5)**
Q.8	**CO 2**	Differentiate between welding, brazing and soldering. Describe these processes with their applications?	**(5)**
Q.9	**CO 3**	Explain the difference between forward and backward extrusion with suitable sketch.	**(5)**
Q.10	**CO 3**	Describe the working of Cupola furnace with diagram.	**(5)**
Q.11	**CO 3**	An engine shaft running at 240 rpm is required to drive a machine shaft by means of a belt. The pulley on the engine shaft is of 1.5 m diameter and that of the machine shaft is of 0.75 m. If the belt thickness is 5 mm, find the speed of the belt, i. There is no slip ii. There is slip of 2% in each pulley.	**(5)**

PART - C: (Attempt 2 questions out of 3) Max. Marks (15)

Q.12	**CO 4**	Explain following: 1. Various patterns allowances used in foundry 2. Properties of moulding send	**(7.5)**
Q.13	**CO 4**	Explain Air refrigeration system with the help of neat diagram and calculate 1 COP if the system absorbed heat at 250K and rejects heat at 300K 2 How many KJ works is required per second if the system absorbing 1050 KJ/Min. at 250K	**(7.5)**
Q.14	**CO 5**	In a Sugarcane Juice machine the pulleys running on parallel shaft 2m apart are connected by open belt drive which diameters are 50 cm and 20 cm respectively. The larger pulley rotates at 200 rpm, coefficient of friction between the belts and pulley is 0.25 and initial tension in the belt is 1KN. 1. Calculate the length of belt. 2. Examine tension in tight side and slack side in the belt. 3. Find amount of power transmitted by the belt drive.	**(7.5)**

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

I B.TECH. (I Sem.) **Roll No. _____**

SECOND MID TERM EXAMINATION 2021-22

Code: 1FY3-07 Category: ESC Subject Name–BASIC MECHANICAL ENGINEERING

(SEC – ALL BRANCHES)

Course Credit: 2

Max. Time: 2 hrs. **Max. Marks: 60**

NOTE:- Read the guidelines given with each part carefully.

Course Outcomes (CO):

At the end of the course the student should be able to:

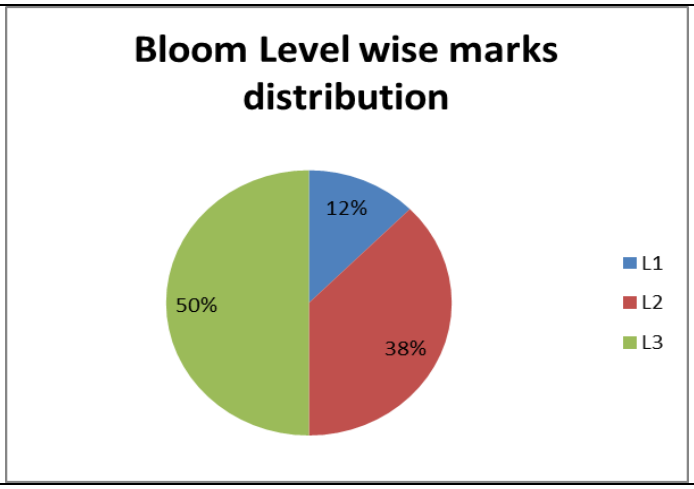
CO1: Describe concepts of thermal, functional design of machine elements, materials and primary manufacturing process

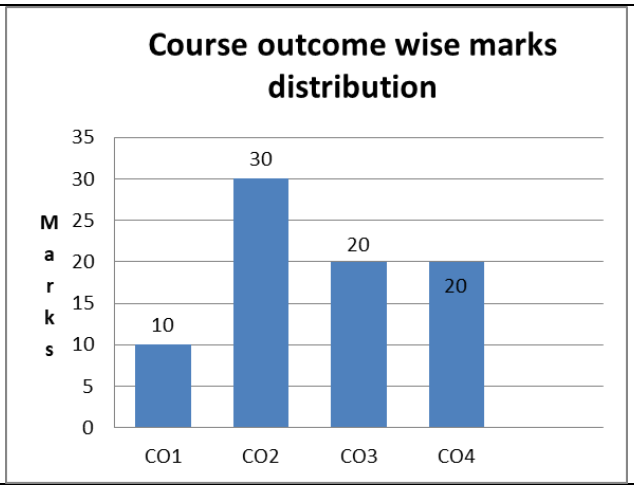
CO2: Classify different types of turbines and power plants, pumps and IC engines, refrigeration system, transmission of power, engineering materials and primary manufacturing processes

CO3: Apply the fundamental knowledge of thermal engineering, in addition to understanding of materials and primary manufacturing process to solve the industrial and societal issues

CO4: Examine about the turbine & pumps, IC engines, refrigeration system, modes of transmission of power, materials and primary manufacturing process

	PART - A: (All questions are compulsory) Max. Marks (10)				
		Marks	**CO**	**BL**	**PO**
Q.1	Write down one difference between the base metal and filler metal in welding.	**2**	1	1	1
Q.2	Differentiate between ferrous and non-ferrous metals in brief.	**2**	1	1	1
Q.3	Define the term Casting.	**2**	1	1	1
Q.4	What is the use of Chisel in metal forming process?	**2**	1	1	1
Q.5	What is velocity ratio of belt drive?	**2**	1	1	1
	PART - B: (Attempt 4 questions out of 6) Max. Marks (20)				
Q.6	Explain the Cupola furnace with diagram.	**5**	**2**	**2**	**1**
Q.7	Give the classification of Engineering Materials. Write down their physical, mechanical and chemical properties.	**5**	**2**	**2**	**1**
Q.8	Explain the various pattern allowances used in foundry with diagram.	**5**	**2**	**2**	**1**
Q.9	Explain the various types of ferrous metals.	**5**	**2**	**2**	**1**
Q.10	Explain the types of gear with suitable diagrams.	**5**	**2**	**2**	**1**
Q.11	Define the term welding. Differentiate between brazing and soldering process.	**5**	**2**	**2**	**1**
	PART - C: (Attempt 3 questions out of 4) Max. Marks (30)				
Q.12	Explain the various types of welding in details with suitable diagram.	**10**	**3**	**3**	**1**
Q.13	What are the causes of various casting defects? Explain in brief. Write down the properties of molding sand along with the ingredients.	**10**	**4**	**3**	**1**
Q.14	What is metal forming process? Differentiate among the forging, rolling, extrusion and drawing in brief with diagram.	**10**	**4**	**3**	**1**
Q. 15	Explain the various methods of heat treatment process.	**10**	**3**	**3**	**1**





BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analyzing, 5 – Evaluating, 6 - Creating)

CO – Course Outcomes; PO – Program Outcomes

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

I B.TECH. (I Sem.) **Roll No. _____**

FIRST MID TERM EXAMINATION 2019-20

Code: 1FY3-07 Category: ESC Subject Name– Basic Mechanical Engineering

SECTION: (A to E) BRANCH – CSE / IT

Max. Time: 2 hrs. **Max. Marks: 40**

NOTE:- Read the guidelines given with each part carefully.

PART - A: (All questions are compulsory) Max. Marks (5)

Q.1	**CO 1**	Define thermodynamics. Describe open system, closed system and isolated system.	**(1)**
Q.2	**CO 1**	What are the aims of preheating of air in the boilers?	**(1)**
Q.3	**CO 1**	What is priming in Centrifugal Pump?	**(1)**
Q.4	**CO 1**	Write the difference between Heterogeneous and Homogeneous system?	**(1)**
Q.5	**CO 1**	List the conventional Power Plants.	**(1)**

PART - B: (Attempt 4 questions out of 6) Max. Marks (20)

Q.6	**CO 2**	Discuss and differentiate fire tube and water tube boilers.	**(5)**
Q.7	**CO 2**	Explain the working of reciprocating pumps with diagram.	**(5)**
Q.8	**CO 2**	Describe the working of Reaction turbine with neat sketch.	**(5)**
Q.9	**CO 3**	Explain the working process of four stroke petrol with neat sketch.	**(5)**
Q.10	**CO 3**	Illustrate water cooling in I.C engine and its compare with air cooling.	**(5)**
Q.11	**CO 3**	Write the advantages and disadvantages of Tidal power plant	**(5)**

PART - C: (Attempt 2 questions out of 3) Max. Marks (15)

Q.12 **CO 4** **(7.5)**

1) Examine the performance of four stroke C.I engine in terms of indicated power and friction loss. If its Delivers 78KW while mechanical efficiency is 75%.

2) Explain the functional working of steam power plant with layout.

Q.13 **CO 4** **(7.5)**

A Four Cylinder Petrol Engine 250 mm Bore diameter 375mm stoke works on Otto Cycle .The Clearance Volume is 0.0152 m^3. The initial pressure and temperature are 1bar and 47^0 c. if the maximum pressure is limited to 25bar

1) Find out compression ratio.

2) Calculate the air slandered efficiency of the cycle

3) To solve mean effective pressure for the cycle

Q.14 **CO 5** With the help of neat diagram explain the functional design of Lancashire boiler. What are its advantages and applications **(7.5)**

POORNIMA COLLEGE OF ENGINEERING, JAIPUR
I Year- B.TECH. (I Sem.)

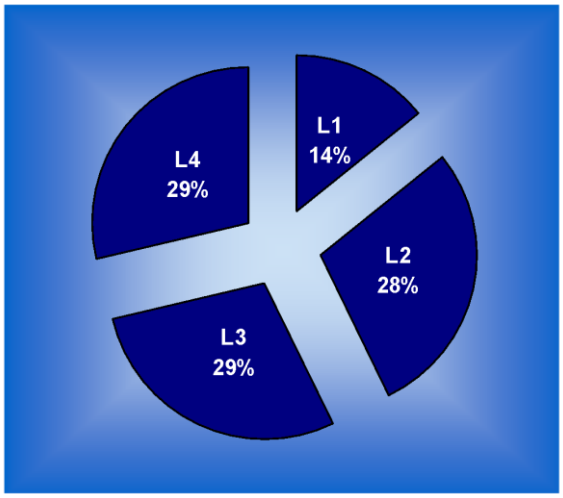
SECOND MID TERM EXAMINATION 2020-21
Code: 1FY3-07, Category: ESC, Subject Name– Basic Mechanical Engineering

(ONLY FOR SECTION –E)

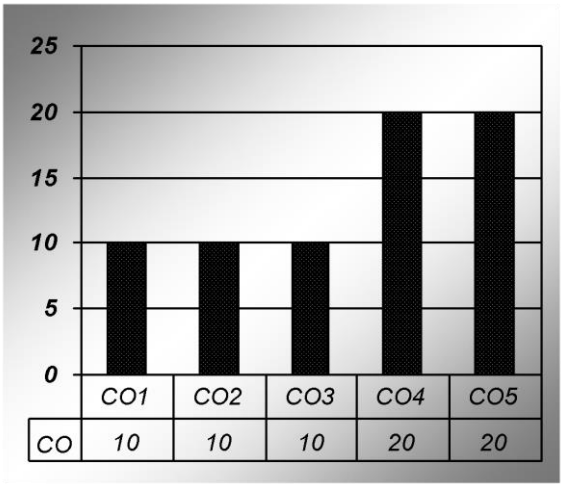
Max. Time: 120 Min. **Max. Marks: 50**

Q No.	CO	PO	BL (L_i)	PI	Marks	Questions
Section – A (Attempt all questions)						
Q1.	CO -1	PO -1	L1	1.3.1	2	Define Slip and Creep in belt drive.
Q2.	CO -1	PO -1	L1	1.3.1	2	What is straight and reverse polarity in electric arc welding process?
Q3.	CO -1	PO -1	L1	1.3.1	2	Define Annealing and Normalising.
Q4.	CO -1	PO -1	L1	1.3.1	2	What is velocity ratio of belt drive?
Q5.	CO -1	PO -1	L1	1.3.1	2	Define Casting process.
Section – B (Attempt any Two questions)						
Q6.	CO -2	PO -1	L2	1.3.1	5+5	(a) Explain engineering materials and their classification in detail. (b) Explain the various zones in a Cupola furnace with diagram.
Q7.	CO -3	PO -1	L2	1.4.1	5+5	(a) Discuss the working principle of electric arc welding with suitable diagram. (b) Differentiate between brazing and soldering. Describe these Processes with their applications?
Q8.	CO -4	PO -2	L3	2.1.2	5+5	(a) What is Gear? Explain different types of gear for transmission of power with suitable diagram. (b) Write and Explain different types of flames generated in oxy-acetylene welding with suitable diagram.
Section – C (Attempt any Two questions)						
Q9.	CO -4	PO -2	L3	2.1.2	10	Explain the various pattern allowances used in foundry. Also explain different properties of moulding sand.
Q10.	CO -5	PO -2	L4	2.1.3	10	Derive an expression for the length of open belt derives.
Q11.	CO -5	PO -2	L4	2.1.3	10	Two pulleys, one 450 mm diameter and the other 200 mm diameter are on parallel shafts 1·95 m apart and are connected by a crossed belt. Find the length of the belt required and the angle of contact between the belt and each pulley. What power can be transmitted by the belt, when the larger pulley rotates at 200 rev/min, if the maximum permissible tension in the belt is 1 KN, and the coefficient of friction between the belt and pulley is 0·25 ?

BLOOM TAXONOMY LEVEL WISE DISTRIBUTION



COURSE OUTCOME WISE DISTRIBUTION



BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analysing, 5 – Evaluating, 6 - Creating)

CO – Course Outcomes; PO – Program Outcomes

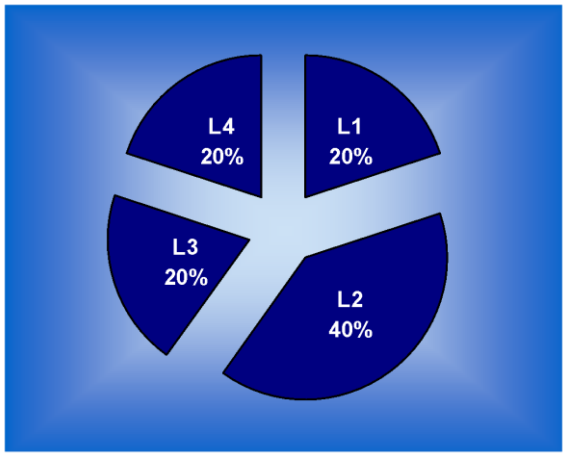
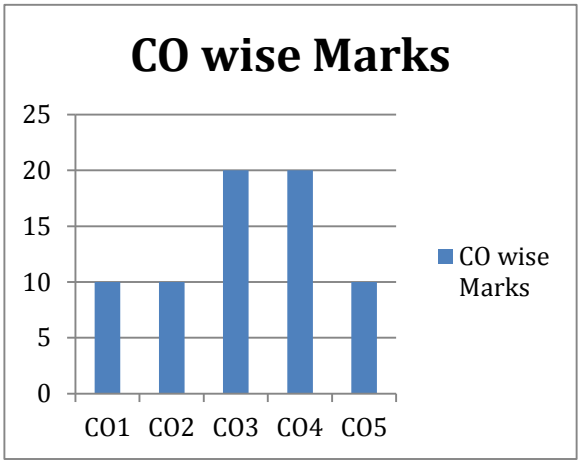
POORNIMA COLLEGE OF ENGINEERING, JAIPUR
I Year- B.TECH. (I Sem.)

SECOND MID TERM EXAMINATION 2020-21
Code: 1FY3-07, Category: ABDH, Subject Name Basic Mechanical Engineering

(ONLY FOR SECTION – D)

Max. Time: 2hours **Max. Marks: 50**

Q No.	CO	PO	BL (L_i)	PI	Marks	Questions
						Part A **(All questions are compulsory) Max. Marks (10)**
Q.1	**CO -1**	**PO -1**	L1	1.3.1	2	Define speed ratio.
Q.2	**CO -1**	**PO -1**	L1	1.3.1	2	Define Ton of Refrigeration.
Q.3	**CO -1**	**PO -1**	L1	1.3.1	2	What is moulding.
Q.4	**CO -1**	**PO -1**	L1	1.3.1	2	Define metal removal processes.
Q.5	**CO -1**	**PO -1**	L1	1.3.1	2	What are the main classifications of stainless steel?
						Part B **(Attempt 2 questions out of 3) Max. Marks (20)**
Q.6	**CO-2**	**PO -1**	L2	1.3.1	5 5	**(a)** An engine shaft running at 300 rpm is required to drive a machine shaft by means of a belt. The pulley on the engine shaft is of 2m diameter and that of the machine shaft is of 1 m. If the belt thickness is 5 mm, Fine the speed of the belt when : (i) There is no slip (ii) There is a slip of 2%. **(b)** Explain various types of forging operations.
Q.7	**CO-4**	**PO-2**	L2	1.4.1	5 5	**(a)** Enumerate the various zones in a Cupola furnace with diagram. **(b)** Explain the working of Electric arc welding with a neat diagram.
Q.8	**CO-3**	**PO-2**	L4	2.1.2	5 5	**(a)** Classify the Engineering materials and explain the application and constituents of some of the important ferrous and non-ferrous materials. **(b)**Explain the difference between forward and backward extrusion.
						Part C **(Attempt 2 questions out of 3) Max. Marks (20)**
Q.9	**CO -3**	**PO -2**	L3	2.1.2	10	Fine the Expression for the length of belt in the open belt drive.
Q.10	**CO-5**	**PO-3**	L4	2.1.3	10	A belt is running over a pulley of diameter 100 cm at 300 rpm. The angle of contact is 150° and coefficient of friction between the belt and the pulley is 0.3. If the maximum tension in the belt is 3000N, Find the power transmitted by the belt.
Q.11	**CO-4**	**PO-2**	L3	2.1.3	10	Describe the various methods of heat treatment with the help of suitable diagram.

BLOOM TAXONOMY LEVEL WISE DISTRIBUTION	COURSE OUTCOME WISE DISTRIBUTION
	

BL Blooms Taxonomy Levels (1- Remembering, 2- Understanding, 3 Applying, 4 Analysing, 5 Evaluating, 6 - Creating)

CO Course Outcomes; PO Program Outcomes

I B.TECH. (II Sem.) **Roll No. _____**

SECOND MID TERM EXAMINATION 2018-19
Code: 2FY3-07 Category: ESC Subject Name–BASIC MECHANICAL ENGINEERING
(BRANCH – ALL BRANCHES)

Max. Time: 2 hrs. **Max. Marks: 40**

NOTE:- Read the guidelines given with each part carefully.

PART - A: (All questions are compulsory) Max. Marks (5)

Q.1	Why alloys are preferred over pure metals in engineering applications?	**(1)**
Q.2	Explain in short the effect of increasing carbon % in steel?	**(1)**
Q.3	Name the different flames obtained in Oxy-acetylene welding?	**(1)**
Q.4	Explain Slip and creep?	**(1)**
Q.5	What is a pattern?	**(1)**

PART - B: (Attempt 4 questions out of 6) Max. Marks (20)

Q.6	List out important properties of moulding sand?	**(5)**
Q.7	An engine shaft running at 240 rpm is required to drive a machine shaft by means of a belt. The pulley on the engine shaft is of 1.5 m diameter and that of the machine shaft is of 0.75 m. If the belt thickness is 5 mm, find the speed of the belt, i. There is no slip ii. There is slip of 2%.	**(5)**
Q.8	Give examples of ferrous alloys with their composition and applications.	**(5)**
Q.9	Compare welding, brazing and soldering process.	**(5)**
Q.10	What is Gear? What are the different types of gears used in power transmission?	**(5)**
Q.11	Briefly describe Casting process with diagram.	**(5)**

PART - C: (Attempt 2 questions out of 3) Max. Marks (15)

Q.12	Classify engineering materials and discuss various properties of engineering materials.	**(7.5)**
Q.13	Two pulleys running on parallel shaft 2m apart are connected by a crossed belt. Calculate the length of belt if the pulley diameters are 50 cm and 20 cm respectively. Also calculate power transmitted by the belt when the larger pulley rotates at 200 rp-m, coefficient of friction between the belts and pulley is 0.25 and maximum permissible tension in the belt is 1KN.	**(7.5)**
Q.14	What is extrusion? Explain different extrusion processes with the help of neat sketches.	**(7.5)**

I B.TECH. (II Sem.) **Roll No. _____**

FIRST MID TERM EXAMINATION 2018-19
Code: 2FY3-07 Category: ESC Subject Name– BASIC MECHANICAL ENGINEERING
(BRANCH – ALL BRANCHES)

Max. Time: 2 hrs. **Max. Marks: 40**

NOTE:- Read the guidelines given with each part carefully.

PART - A: (All questions are compulsory) Max. Marks (5)

Q.1	Define thermodynamics. Explain open system, closed system and isolated system.	**(1)**
Q.2	What are the aims of preheating of air in the boilers?	**(1)**
Q.3	What is priming in Centrifugal Pump?	**(1)**
Q.4	Describe the classification of I C Engine?	**(1)**
Q.5	Define Ton of Refrigeration.	**(1)**

PART - B: (Attempt 4 questions out of 6) Max. Marks (20)

Q.6	Define and differentiate fire tube and water tube boilers.	**(5)**
Q.7	Explain the working of reciprocating pumps with neat diagram.	**(5)**
Q.8	Describe the working of Reaction turbine with neat sketch.	**(5)**
Q.9	Explain the working of four stroke petrol with neat sketch.	**(5)**
Q.10	Describe the working of Solar Power plant.	**(5)**
Q.11	Explain vapour compression refrigeration system with the help of neat diagram?	**(5)**

PART - C: (Attempt 2 questions out of 3) Max. Marks (15)

Q.12	With the help of neat diagram explain the working of Lancashire boiler. What are its advantages?	**(7.5)**
Q.13	Explain the different methods of cooling and lubrication systems in IC engine.	**(7.5)**
Q.14	Describe- a) Velocity Compounding of impulse steam turbine b) Nuclear Reactor c) Two stroke petrol engine	**(7.5)**

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

B.TECH. (II Semester) **Roll No……**

MID TERM EXAMINATION 2021-22

Code: 2FY3-07 Category: PCC Subject Name–BASIC MECHANICAL ENGNEERING (BME)

(Sections : F to J)

Course Credit: 02

Max. Time: 2 hrs. **Max. Marks: 60**

NOTE:- Read the guidelines given with each part carefully.

Course Outcomes (CO):

At the end of the course the student should be able to:

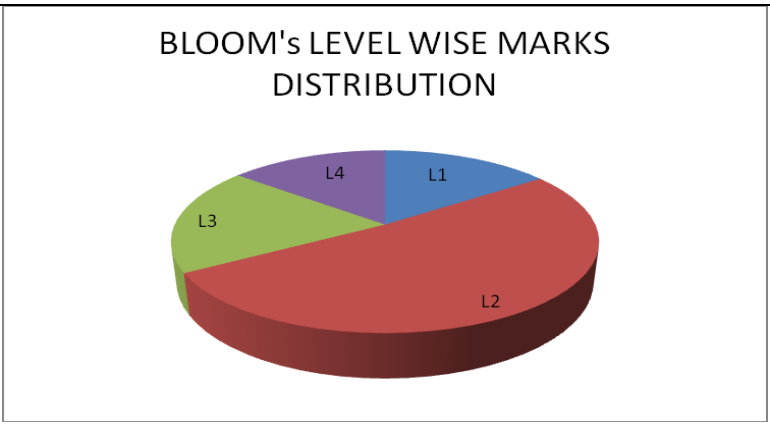
CO1: To describe concepts of thermal, functional design of machine elements, materials and primary- manufacturing process.

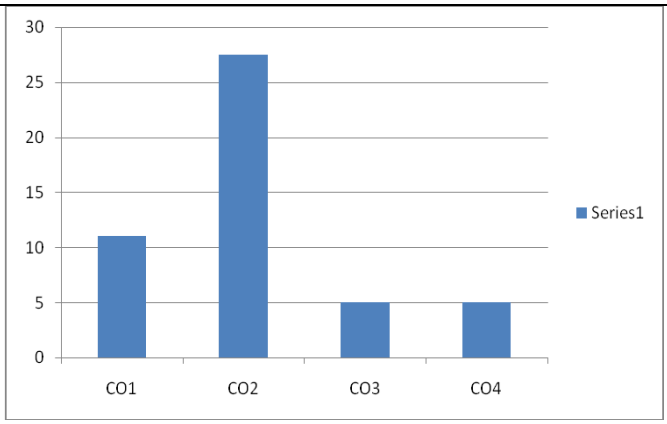
CO2: Classify different types of turbines and power plants, pumps and IC engines, refrigeration system, transmission of power, engineering materials and primary manufacturing processes

CO3: To apply the fundamental knowledge of thermal engineering, in addition to understanding of materials and primary- manufacturing process to solve the industrial and societal issues

CO4: To examine about the turbine & pumps, IC engines, refrigeration system, modes of transmission of power, materials and primary manufacturing process.

	PART - A: (All questions are compulsory) Max. Marks (10)				
		Marks	**CO**	**BL**	**PO**
Q.1	Explain the term thermodynamics.	2	1	1	1
Q.2	Classify the IC Engines.	2	1	1	1
Q.3	List out the important machines or devices which are used in power transmission.	2	1	1	1
Q.4	Write down the name of various “Forging Operations”	2	1	2	1
Q.5	Define the term “Heat Treatment”	2	1	2	1
	PART - B: (Attempt 4 questions out of 6) Max. Marks (30)				
Q.6	Explain the working of four stroke petrol engine.	5	2	1	1
Q.7	Explain the working principle of window air conditioner with suitable sketch.	5	3	3	1
Q.8	State about the any two heat treatment process with suitable diagram.	5	2	2	1
Q.9	Define the term Pattern Allowances and explain any two pattern allowances.	5	1	3	1
Q.10	Explain the working of reciprocating pump with near sketch	5	2	2	1
Q.11	Explain the important types of gears used in power transmission.	5	2	2	1
	PART - C: (Attempt 2 questions out of 4) Max. Marks (20)				
Q.12	Describe the working of any one fire tube boiler with neat sketch.	10	5	2	1
Q.13	Explain the extrusion process with its industrial applications.	10	5	4	1
Q.14	Differentiate the arc welding with the gas welding process with suitable diagram.	10	2	2	1
Q.15	Explain the various refrigeration system with suitable diagram.	10	5	4	1





BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analyzing, 5 – Evaluating, 6 - Creating)

CO – Course Outcomes; PO – Program Outcomes

2E3206

Roll No. 21ESKCA009

2E3206

[Total No. of Pages : 2]

B.Tech. II Sem (Main) Examination, July - 2022
2FY3-07 Basic Mechanical Engineering

Time : 3 Hours **Maximum Marks : 70**

Attempt all Ten questions from Part A, Five questions out of Seven questions from Part B and Three questions out of Five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

Attempt **ALL** questions are compulsory. **(10×2=20)**

1. What is industrial engineering? Write its scope. (2)
2. Explain the adiabatic system with suitable example. (2)
3. Describe Zeroth law of thermodynamics. (2)
4. Define steam boilev and write different types of boiler. (2)
5. Define blade velocity coefficient. (2)
6. Define toughness and brittleness. (2)
7. What do you understand by chamfering and Baring. (2)
8. What is pattern in casting process? (2)
9. What are different types of belt drives? (2)
10. What is the difference between efficiency and Co-efficient of performance. (2)

PART - B

(Analytical/Problem solving questions)

Attempt any **Five** questions: **(5×4=20)**

1. Why cooling of I.C. Engines required? Describe briefly any one cooling method used in I.C. Engines. **(4)**
2. Write short note on comfort air conditioning. **(4)**
3. The distance between two bearing of a shaft which transmits 200 h.p. at 250 rpm is 250 cm. It is subjected to torsion only. Determine the diameter of the shaft for steady loading if the safe shear stress is 400 kg/cm^2. **(4)**
4. Derive an expression for the length of open belt drive. **(4)**
5. Differentiate between welding, braning and soldering processes. **(4)**
6. What is metal casting? Describe different methods of metal casting. **(4)**
7. Explain the various engineering materials properties. **(4)**

PART - C

(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any **Three** *questions:* **(3×10=30)**

1. An engine, based on air standard Otto cycle, is supplied with air at 0.1 Mpa and 35° C. The compression ratio is 8. The heat supplied is 500 KJ/kg. for given working air specific heat capacity at constant pressure and at constant volume is 1.005 KJ/kgk, 0.718 KJ/kgk respectively find the following. **(10)**
   a) Efficiency of an engine
   b) Temperature and pressure at the end of compression
   c) Maximum temperature of the cycle.
2. What is meant by refrigeration system? Describe vapor compression refrigeration system with suitable diagram. **(10)**
3. Explain in detail, the various operations of drilling machine with diagrams. **(10)**
4. Explain the various stages of heat treatment process. **(10)**
5. A belt is running over a pulley of diameter 100 cm at 300 rpm. The angle of contact is 150° and coefficient of friction between the belt and pulley is 0.3. If the maximum tension in the belt is 3000 N, find the power transmitted by the belt. **(10)**

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1E2407

Roll No

Total No of Pages: 2

1E2407

B. Tech. II-Sem. (Back) Exam., Oct.-Nov. - 2020

ESC

2FY3 – 07 Basic Mechanical Engineering

Time: 2 Hours

Maximum Marks: 65
Min. Passing Marks: 23

Instructions to Candidates:

Attempt all five questions from Part A, four questions out of six questions from Part B and one questions out of three from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL

2. NIL

PART – A

(Answer should be given up to 25 words only) **[5×2=10]**

All questions are compulsory

Q.1 Define Zeroth law of thermodynamics.

Q.2 What is priming in pump?

Q.3 Define coefficient of performance of Refrigerator. Also write its expression.

Q.4 What are the differences between Soldering and brazing?

Q.5 Define toughness and brittleness.

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PART – B

(Analytical/Problem solving questions) **[4×10=40]**

Attempt any four questions

Q.1 What do you understand by steam boilers? How they are classified?

Q.2 Describe the four stroke SI engine with the help of PV and TS diagrams.

Q.3 What do you understand by the refrigeration system? Describe the most popular refrigerant cycle used in refrigerators. Explain their components in brief.

Q.4 Describe the different types of the Gear trains with diagram and also derive their expression for speed ratio.

Q.5 Explain the various forging operations with suitable neat diagrams.

Q.6 Explain the various heat treatment methods with the help of suitable diagram.

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[1×15=15]**

Attempt any one questions

Q.1 What is Nuclear power plant? Explain the various components of Nuclear power plant. Describe the working of Nuclear power plant, advantages and disadvantages.

Q.2 An engine, based on air standard otto cycle, is supplied with air at 0.1 MPa and 35°C. The compression ratio is 8. The heat supplied is 500 kJ/kg. For given working air specific heat capacity at constant pressure and at constant volume is 1.005 kJ/kgK, 0.718kJ/kgK respectively, find the following-

(a) Efficiency of an engine

(b) Temperature and pressure at the end of compression

(c) Maximum temperature of the cycle

Q.3 What is Open Belt Drive? Derive the expression for the length of belt of open belt drive.

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1E2407

Roll No. Total No of Pages: 3

1E2407

B. Tech. II - Sem. (Main) Exam., May - 2019

ESC

2FY3 – 07 Basic Mechanical Engineering

Time: 2 Hours **Maximum Marks: 80**

Instructions to Candidates:

Attempt all five questions from Part A, four questions out of six questions from Part B and two questions out of three from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

(Answer should be given up to 25 words only) **[5×2=10]**

All questions are compulsory

Q.1 Explain the isolated system. [2]

Q.2 What is IP & BP in the Internal Combustion Engine? [2]

Q.3 Define the coefficient of performance of Refrigerator. [2]

Q.4 What is pattern in casting process? [2]

Q.5 What is computer aided manufacturing? [2]

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RTU paper

PART – B

(Analytical/Problem solving questions) **[4×10=40]**

Attempt any four questions

Q.1 Explain the velocity triangle for single stage impulse turbine. [10]

Q.2 Describe the four stroke Spark – Ignition engine with suitable diagram. [10]

Q.3 Define construction & working of vapour compression refrigeration system with diagrams. [10]

Q.4 A belt is a running over a pulley of diameter 100 cm at 300 rpm. The angle of contact is 150° and coefficient of friction between the belt and pulley is 0.3. If the maximum tension in the belt is 3000N, find the power transmitted by the belt. [10]

Q.5 Explain the various operations of drilling machine with diagrams. [10]

Q.6 Explain the various stages of Heat treatment process. [10]

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[2×15=30]**

Attempt any two questions

Q.1 What is Diesel power plant? Explain Operation, Layout, Requirement and advantage and disadvantage of Diesel power plant. [15]

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Q.2 3 kW of power is transmitted by an open belt drive. The linear velocity of the belt is 3 m/s. The angle of lap on the smaller pulley is 150°. The coefficient of friction is 0.3. Determine the effect on power transmission in the following cases – [15]

(a) Initial tension in the belt is increased by 10%.

(b) Initial tension in the belt is decreased by 10%.

(c) Angle of lap is increased by 10% by the use of an idler pulley, for the same speed and the tension on the tight side.

(d) Coefficient of friction is increased by 10% by suitable dressing to the friction surface of the belt.

Q.3 Why testing of an internal combustion engine is required? Explain the various testing parameters briefly. [15]

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1E2407

1E2407

B. Tech. I - Sem. (Main/Back) Exam., Dec. 2019
1FY1 – 07 Basic Mechanical Engineering

Time: 2 Hours

Maximum Marks: 80
Min. Passing Marks: 28

Instructions to Candidates:

Attempt all five questions from Part A, four questions out of six questions from Part B and two questions out of three from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

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PART – A

(Answer should be given up to 25 words only) **[5×2=10]**

All questions are compulsory

Q.1 Define blade velocity co – efficient.

Q.2 What is the role of moderator in nuclear power plant?

Q.3 Why priming of a pump is required?

Q.4 Describe Zeroth law of thermodynamics.

Q.5 Differentiate between Joule's law and Gay – Lussac's law

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PART – B

(Analytical/Problem solving questions) **[4×10=40]**

Attempt any four questions

Q.1 Write a short note on points given below-

(a) Power output of Parson's reaction turbine.

(b) Velocity diagram of Parson's reaction turbine

(c) Blade efficiency of Parson's reaction turbine.

(d) Stage efficiency of Parson's reaction turbine

(e) Nozzle efficiency of Parson's reaction turbine

Q.2 (a) Discuss various components of nuclear power plant.

(b) Differentiate between coal thermal power plant and Geo thermal power plant in brief.

Q.3 Explain working of a reciprocating pump along with their applications and neat diagram.

Q.4 Describe the following points –

(a) Case hardening

(b) Unit of Refrigeration

(c) Co – efficient of performance

(d) Cast Iron and types

(e) Cutting speed

Q.5 Explain Locomotive Boiler by using following points –

(a) Neat sketch

(b) Working principle

(c) Components / parts & their working

(d) Applications

Q.6 Explain the following processes-

(a) Soaking

(b) Brazing

(c) Soldering

(d) Drilling

(e) Extrusion

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PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[2×15=30]**

Attempt any two questions

Q.1 (a) Describe different types of belt drives.

(b) Derive an expression for the length of open belt drive.

(c) Ice is formed at 0°C from water at 20°C. The temperature of refrigerant is 10°C. Find the Ice formed per kWh. Assume latent heat of Ice is 334 kJ/kg. Assume working in perfect Carnot cycle. http://www.rtuonline.com

Q.2 (a) Explain working of an I.C. Engine with their components.

(b) Derive the formula of mechanical efficiency and indicated power of an I.C. Engine.

Q.3 (a) Describes Electrolux refrigerator with neat sketch.

(b) Two parallel shafts 6m apart are to be connected by a belt running over pulleys of diameter 50 cm and 30 cm respectively. Determine the exact and approximate lengths of belt required.

(i) If the belt is open

(ii) If the belt is crossed

(c) What is centrifugal tension? Derive an expression for the same.

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Roll No. ___

Total No of Pages: 3

2E2306

B. Tech. II Sem. (Main) Exam., May – 2018

ME -102 Basic Mechanical Engineering

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 28

Instructions to Candidates:

*Attempt any **five questions** including Question No. 1, which is Compulsory. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

1. NIL

2. NIL

Q.1 Compulsory [8×2=16]

Answers for each sub-question be given 50 words- (each question carry 2 marks)

(a) Describe different modern tools used in mechanical engineering.

(b) Describe law of thermodynamics.

(c) Describe different fields of manufacturing technology.

(d) Differentiate between water tube boiler and fire tube boiler.

(e) Differentiate between impulse and reaction turbine.

(f) Write a short note on different types of power plant.

(g) What is industrial engineering & its scope?

(h) Define steam boiler & write different types of boiler.

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Q.2 (a) Differentiate between 2 stroke & 4 stroke engine. [4]

(b) Describe ideal Otto cycle & derive formula for its efficiency. [4]

(c) Diesel cycle with compression ratio of CR=20 : 1 and cut –off ratio α=2. The air is at 100 kPa=1 bar. 20°C (293K), and the volume of the chamber is 500 cm^3 prior to the compression stroke.

(i) Specific heat capacity at constant pressure of air at atmospheric pressure and room temperature: $C_p = 1.01$ kJ/kgK

(ii) Specific heat capacity at constant volume of air at atmospheric pressure and room temperature: $C_v = 0.718$ kJ/kgK.

(iii) $K = C_p/C_v = 1.4$

Calculate: The mass of intake air, the temperature T2, the pressure P2, the temperature T3, the amount of heat added by burning of fuel-air mixture, the thermal efficiency of this cycle. [8]

Q.3 (a) What is meant by refrigeration system?Describe vapor compression refrigeration system. [8]

(b) What is air conditioning ? Draw and describe different components used in it. [4]

(c) Ice is formed at 0°C from water at 20°C, the temperature of refrigerant is 10°C. Find the ice formed per KWH ,assume latent heat of ice is 334 kJ/kg. Assume working in perfect Carnot cycle. [4]

Q.4 (a) What is gear transmission? Describe different types of gear. [8

(b) Describe with figure different types of belt drive. [4

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(c) Two spur gear have velocity ratio 1/3, driven gear has 72 teeth of 8 module & rotate at 300 rpm, calculate no. of teeth & speed of driver, also calculate pitch line velocity. Given:

T2=72, VR=1/3, N2=300 rpm, m=8mm

VR=N2/ N1= T1/T2=1/3. [4]

Q.5 (a) Write a short note on- [6]

(i) Extrusion

(ii) Rolling

(iii) Drawing

(b) What is metal casting? Describe different methods of metal casting. [5]

(c) Write a brief note on Lathe machine. [5]

Q.6 (a) Describe hardening and tempering of steel. [8]

(b) Describe the following terms- [8]

(i) Case hardening

(ii) Carburizing

(iii) Nitriding

(iv) Cyaniding

(v) Carbonitriding

Q.7 (a) What is Computer Added Design (CAD)? Describe its working. [8]

(b) What is MEMS? Write an essay on it. [8]

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Roll No. _____

Total No. of Pages : 3

1E2407

B. Tech. I Semester (Main) Examination, Dec. - 2018

ESC

1FY3-07 Basic Mechanical Engineering

Time : 2 Hours **Maximum Marks : 80**

Instructions to Candidates :

*Attempt all **five** questions from **Part A**, selecting **four** questions from **Part B** and **two** from **Part C**. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

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Part - A

(All questions compulsory)

Short answer questions (up to 25 words) **(5×2=10)**

1. Differentiate between Boyle's law and Charle's law.
2. Describe second law of Thermodynamics.
3. Define the properties of Lubricating oil or Lubricant.
4. Write the comparison between hot working and cold working processes.
5. What do you understand by the following?
   i) Chamfering ii) Baring

Part - B

(Attempt any four questions)

Analytical / Problem solving questions **(4×10=40)**

1. a) A V-belt of 6.4 Cm^3 cross-section has a groove angle 30^0 and the angle of lop of 165^0. The frictional co-efficient is 0.1. The weight of the V-belt is 1.4 Kg/ meter run. The maximum safe stress is 3 N/mm^2. Calculate the power transmitted at the velocity of 20 meter/sec. **(5)**

   b) Explain clearly what is meant by 'entropy' of a gas show on the FS diagram isothermal and adiabatic processes. **(5)**

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2. a) Why is cooling of I.C. engines done? Describe briefly the various cooling methods used in I. C. engines. (5)

b) Explain the working of surface condenser. (5)

3. a) Write short note on Comfort air Conditioning. (5)

b) What are the advantages and disadvantages of Chain drive over belt drive? (5)

4. a) Differentiate between Homogeneous & Heterogeneous systems. (4)

b) Differentiate between welding, brazing and soldering processes. (6)

5. a) What are the advantages of artificial draught system over natural draught system? (5)

b) Derive expression of indicated power for a single stage reciprocating air compressor. (5)

6. a) Explain the various pattern allowances used in foundry. (5)

b) Explain the various engineering materials properties. (5)

Part - C

(Attempt any two)

Descriptive / Analytical / Problem solving / Design question

(2×15=30)

1. a) A four cylinder petrol engine of 250mm bore and 375 mm stroke works on Otto cycle. The clearance volume is 0.01052m^3. The initial pressure and temperature are 1 bar and 47°C. If the maximum pressure is limited to 25 bar, find the following. http://www.rtuonline.com

i. The air standard efficiency of the cycle.

ii. The mean effective pressure for the cycle. (10)

b) The distance between two bearing of a shaft which transmits 200 h. p. at 250 rpm is 250 cm. It is subjected to torsion only. Determine the diameter of the shaft for steady loading if the safe shear stress is 400 Kg/cm^2. (5)

2. a) Describe the procedure for making green sand mould with the help of a sketch. (7)

b) A Fluid system under goes a non- flow frictionless process from $V_1 = 0.12m^3$ to $V_2 = 0.04\ m^3$ in accordance with $V = 4.5/p - 2$ where p is in bar and V is in m^3. During the process, the fluid system rejects 40kJ of heat. Determine change in enthalpy and internal energy. (8)

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(5)

3. a) Define steam boiler & write different types of Boiler

b) 2 kw of power is transmitted by an open belt drive. The linear velocity of belt is 2 m/s. The angle of lop on the smaller pulley is 160^0. The coefficient of friction is 0.25. Determine the effect on power transimission in the following cases:

i. Initial tension in the belt is increased by 8%

ii. Initial tension in the belt is decreased by 8%

iii. Angle of lop is increased by 8% by the use of an idles pulley, for the same speed and the tension on the tight side.

iv. Coefficient of friction is increased by 8% by suitable dressing to the friction surface of the belt. **(10)**

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POORNIMA
COLLEGE OF ENGINEERING

DETAILED LECTURE NOTES

Mid-term I - 2022-23

Part-I

Q1. Explain the term thermodynamics briefly.

Ans:- Thermodynamics is the branch of science that deals the transfer of energy and its effect on physical properties of substance. It is the relationship between heat energy and work.

Q2. Give the defination of fire tube boiler.

Ans:- In the fire-tube boilers, hot gases from the furnace pass through the tubes which are surrounded by water.

Q3. Define term manufacturing technology.

Ans:- Manufacturing technology decribe the application of tools and process, developed through scientific industrial and engineering advances, to improve efficiency, quality and productivity of operation

Q4. State term, "One ton of refrigeration".

Ans:- A ton of refrigeration (ITR) is defined as the amount of heat, which is to be extracted from one ton of water at 0°C in order to convert into ice at 0°c (ITR=210KJ/min or 3.5KW).

Q5. What do you mean by COP of refrigerator?

Ans:- When a refrigerator is removing 'Q' amount of heat consuming W amount of work, then the performance of refrigerator is

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determined by the ratio. Q/W which is called coefficient of performance.

$$*\boxed{COP = Q/W}$$

Part - B

Q6. What are refrigerants. Explain the desirable properties of a refrigerant.

Ans:- A refrigerant is working fluid in a refrigera-tor. It is capable of absorbing heat at a lower temperature and rejecting the heat at a higher temp. in the form of sensible heat or latent heat.

* Describe properties of Refrigerants.

(i) Low boiling point.
(ii) Low freezing point.
(iii) High latent heat of evaporation.
(iv) High specific heat and low viscosity.
(v) It should easily liquify.
(vi) Odourless & no hazardous effect on leakage.
(vii) Chemical stability.
(viii) Non-flammable.
(ix) Low-cost.

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Types of refrigerants:-

(a) Feron-12 → Dichloro difloro methane (CCl_2F_2)
(b) Freon-22 → Monochloro difloro methane ($CHClF_2$).
(c) Ammonia.

Q7. Explain the working principle of Window Air Conditioner.

Ans:- The blower sucks the warm air from through air filter and evaporator or cooling coil of refrigeration system. Then, it delievers cooled & dehomodified air back into room through supply air is passed over evaporator coil is drained out. the supply air grill has adjustable louvers or deflectors for changing direction of air upwards, downwards or horizontally. Mechanised deflectors are available in same window air conditioner which continuously change direction of air flow to ensure uniform distribution of conditioned air inside the room. The conditioned air sent to room mixes with room air and decreases the temperature and humidity levels in room fresh air is admitted through adjustable damper for purpose of ventilation.

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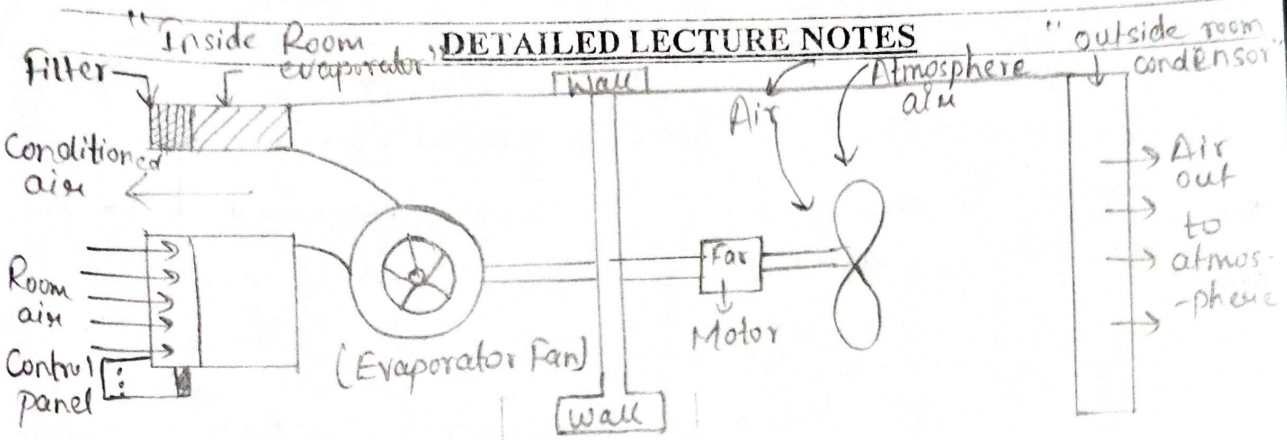

Q8. Write down different blw two stroke petrol and diesel engine.

Ans:-

2 stroke petrol engine	2 stroke diesel engine.
(1) Compression ration is 7-10	(1) Compression ration. is 15-20
(2) Petrol-air mixture is compressed.	(2) only air is compressed
(3) Compression pressure is 15-20 bar.	(3) Compression pressure is 30-40
(4) Compression temp. is about 400°C	(4) Compression temp. above 550°C
(5) Peak pressure is in the range of 50-70 bar	(5) Peak pressure is highin the range of 80-100bar
(6) Weight of engine is less	(6) weight of engine is more
(7) cost of engine is less.	(7) Cost of engine is more.
(8) Operation cost per km is high due to high cost of petrol and lower thermal efficiency	(8) Operation cost per km is considerable low due to low cost of diesel and higher thermal efficiency

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Q9. Explain importance of industrial eng. with some industrial example.

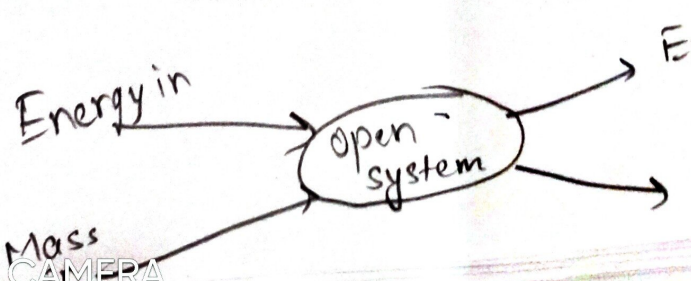
Ans:- Industrial eng. is a branch of eng. that deals with improving process.

It helps in reducing production cost improve efficiency improve quality of services and products make sure workers stage of healthy & protect environment. Industrial eng. eliminates the waste of time, money energy, material and many other comodities.

Take for Instance, an industrial eng. working in a factor. they may work to streamline as assembly line while making it safer at same line.

Q10. Differentiate among the terms open, closed and isolated system.

Ans:- Open system:- A system which allows both mass and energy transfer across boundaries is called open system.



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Example → A cup of coffee without lid.

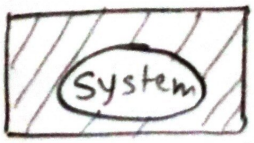
Closed system :- A system in which mass is fixed and energy may be transferred from system to surroundings.

Example :- A cup of coffee with a lid.



Isolated system :- there is no interaction b/w system and surroundings is known as isolated system.

Example :- Thermo flask



Q11. How would you classify internal combustion engines?

Ans :- We can classify IC engines of following basis:

1) According to type fuel used :-

* Petrol engine
* Diesel engine.

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2) According to cooling system :-

* Air cooled engine
* Water - cooled engine

3) According to cycle of operation :-

* Four stroke engine
* Two stroke engine

4.) According to number of cylinder :-

* Single - cylinder engine
* Multicylinder engine.

5) According to charge pressure :-

* Natural aspirated engine
* Super charged engine.

6) On the basis of thermodynamics cycle

* Constant volume combustion
* Constant pressure combustion
* Dual cycle combustion.

7) Ignition method :-

* Spark ignition method
* Compression method.

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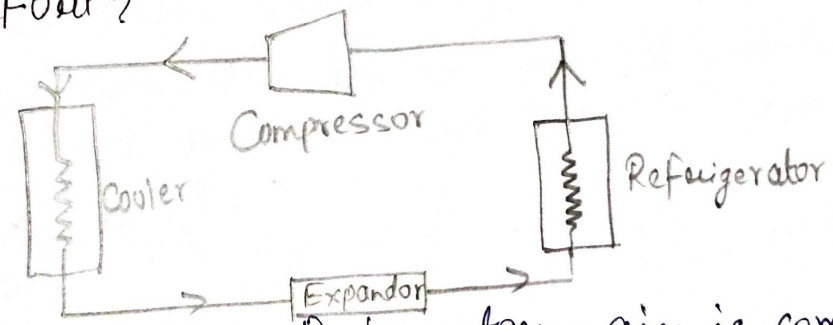
8) On the basis of engine speed:-

* Low speed engine < 100 rpm
* Medium speed engine - 100 - 200 rpm
* High - speed engine — > 250 rpm

Part-C

Q12. Explain air - conditioning in refrigeration and air conditioning system. Why is it important in comfort?

Ans:-



In air compressed refrigerator, air is compressed in compressor where pressure and temperature are increased. the cold air from cooler expands in expander causing drop in pressure and temperature.

Air conditioning involves controlling and maintaining the desired temperature, humidity and direction of flow air in closed space. Also, Filtering and cleaning of air is carried out by the air conditioning system.

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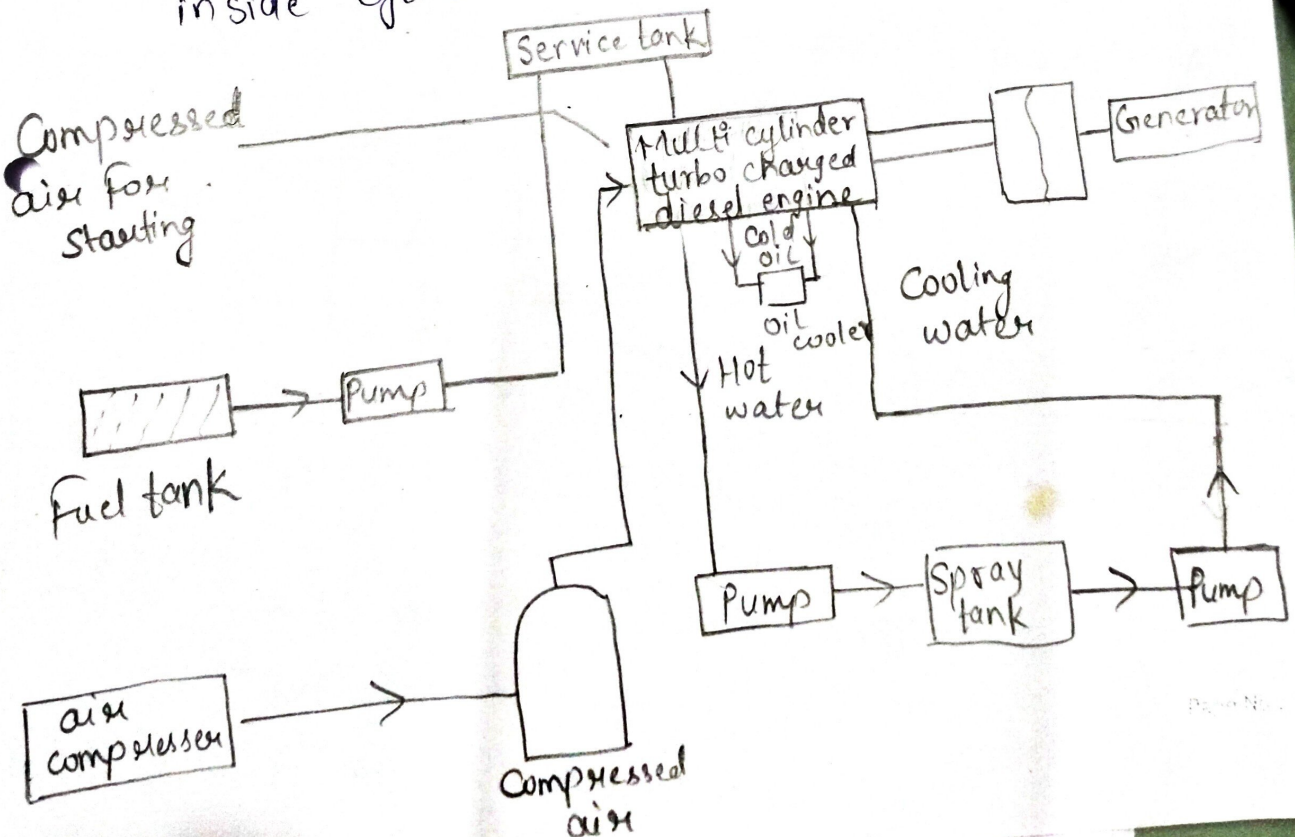
- Air conditioning of houses, hotels, theaters etc.
- Hospitals, operation theatres and ICU are air conditioned.
- For comfort passenger in cars, buses, trains etc.

Q, Q13 Describe working Diesel Power plant.

A: Ans:- Normally, multi cylinder, 2-stroke engine (diesel) are used in powerplant. In a turbo-charged engine, atmosphere air is compressed by compresser. Run by an exhaust-driven gas turbine and compressed air is taken inside cylinder.



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...moves upto TDC.

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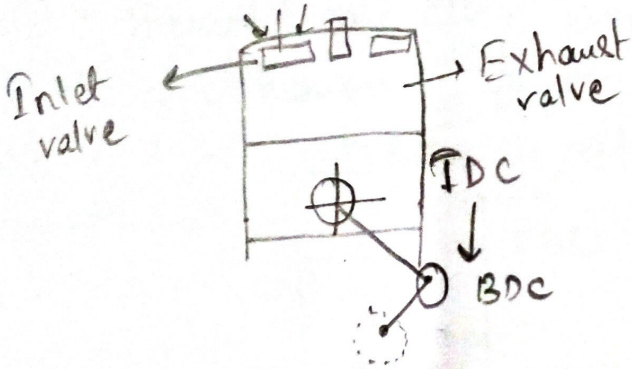
Due to turbocharging operating temperature of engine is increased. So, lubricating oil should be cooled in oil cooler. The cooling water from engines is normally cooled in a spray tank and recirculated.

Q14. Explain working of Four-stroke-diesel engine.

Ans:- SUCTION STROKE:- During stroke, inlet valve is kept opened and the exhaust valve is closed. The piston comes dow to Bottom Dead centre (BDC) from TOP dead centre (TDC). Air is drawn inside engine cylinder through inlet valve.



COMPRESSION STROKE:- In this stroke, both inlet and exhaust valves are kept closed. The air is compressed when piston moves upto TDC.

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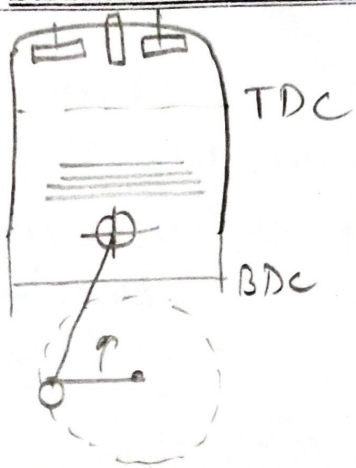
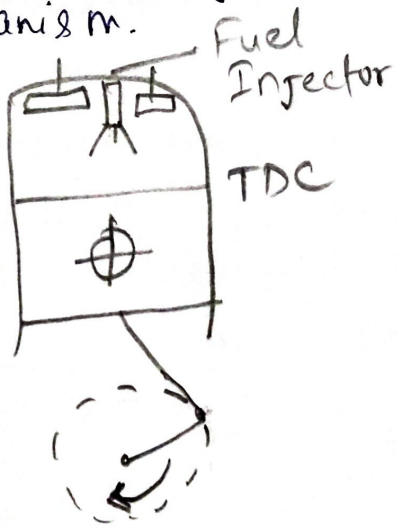


WORKING OR POWER STROKE :- During this stroke, both valve are kept closed. the piston is pushed down from TDC to BDC. the force above piston is transmitted crank shaft through connecting rod and crank mechanism.



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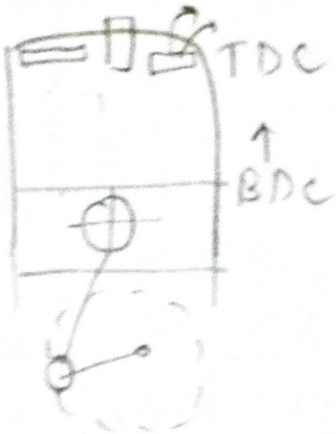
EXHAUST VALVE :- During stroke, exhaust valve is kept opened and inlet valve is kept closed. the piston moves up from BDC to TDC. The waste gases are sent through exhaust valve and cycle is repeated.



Q15. What do you understand by Compounding of steam turbines?

Ans:- Compounding of system turbines is the strategies in which energy from the steam is extracted is a number of stages rather than a single stage in a turbine. A compounded Steam turbine has multiple stage.

Eg:- It has more than one set of nozzles and motors, in series, key to the shaft of fixed to this casing, so that either the steam

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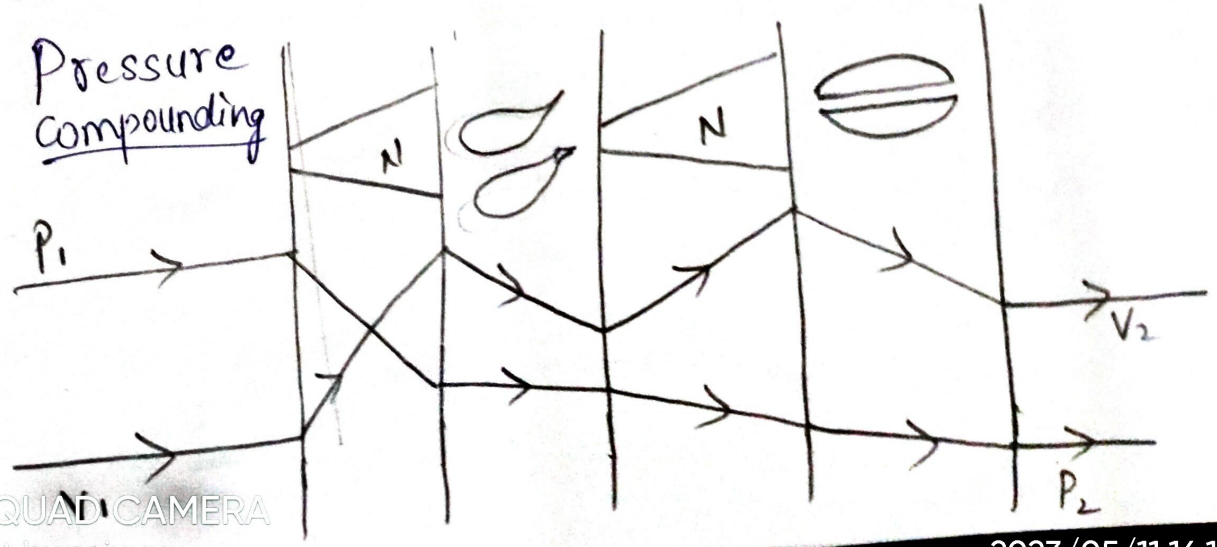
Pressure or the jet velocity is absorbed by the turbine is no. of stages.

Compounding steam turbines are used to reduce motor speed to achieve optional operating rpm values. The multiple system of motors are connected in series keyed to a common shaft and the steam pressure or velocity is absorbed in stages as it flows over the blades. the steam produced in the boiler has sufficiently high enthalpy when superheated. In all turbines the blade velocity of the steam passing over the blade.

Types of Steam turbines :-

a) Impulse turbine

b) Reaction turbine.



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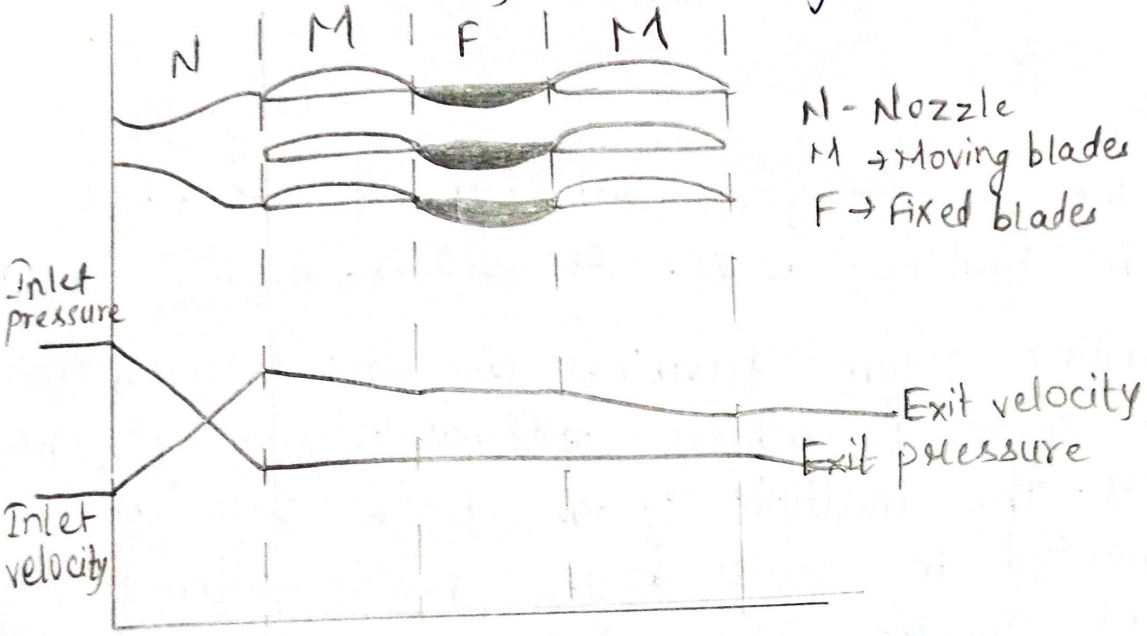
Velocity compounding.



POORNIMA COLLEGE OF ENGINEERING, JAIPUR

B.TECH. (I Semester) Roll No.....

I MID TERM EXAMINATION 2022-23

Code: 1FY3-07 Category: PCC Subject Name–BASIC MECHANICAL ENGINEERING (BME)

Course Credit: 02

Max. Time: 2 hrs. Max. Marks: 60

NOTE:- Read the guidelines given with each part carefully.

Course Outcomes (CO):

At the end of the course the student should be able to:

CO1: Students will be able to retrieve basic concepts of thermal and manufacturing processes. **(Recall/Remembering)**

CO2: Students will able to compare different types of thermal and manufacturing processes and. **(Understand)**

CO3: Students will be able to annotate about the functioning of turbine & pumps, IC engines, refrigeration system, modes of transmission of power, materials and primary manufacturing process. **(Apply)**

CO4: Students will be able to appraise the fundamental knowledge of thermal engineering, in addition to understanding of power transmission to solve the industrial and societal issues. **(Examine)**

		Marks	CO	BL	PO
	PART - A: (All questions are compulsory) Max. Marks (10)				
Q.1	Explain the term thermodynamics briefly.	2	1	1	1
Q.2	Give the definition of the fire tube boiler.	2	1	1	1
Q.3	Define the term manufacturing technology.	2	1	1	1
Q.4	State the term "one ton of refrigeration".	2	1	1	1
Q.5	What do you mean by the coefficient of performance (COP) of a refrigerator?	2	1	1	1
	PART - B: (Attempt 4 questions out of 6) Max. Marks (20)				
Q.6	What are refrigerants? Explain the desirable properties of a refrigerant.	5	1	1	1
Q.7	Explain the working principle of window air conditioner with suitable sketch.	5	3	3	1
Q.8	Write down the difference between two strokes SI and CI Engine.	5	2	2	1
Q.9	Explain the importance of industrial engineering with some industrial examples.	5	3	3	1
Q.10	Differentiate among the terms open system, closed system and isolated system.	5	2	2	1
Q.11	How would you classify the internal combustion engines?	5	3	3	1
	PART - C: (Attempt 3 questions out of 4) Max. Marks (30)				
Q.12	Explain the air-conditioning in the refrigeration and air-conditioning system. Why is it important in the concern of human comfort?	10	3	3	1
Q.13	Describe the working diesel power plant with the help of neat diagram.	10	3	3	1
Q.14	Explain the working of a four stroke diesel engine with the help of a suitable diagram?	10	3	3	1
Q.15	What do you understand by compounding of steam turbines? Explain pressure compounding for two stage impulse steam turbines.	10	3	3	1

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Q1 Mid term- 2

What is slip

1 → slip is defined simply as the difference between the speed of the two rotating members. In an induction motor slip is a measure of difference b/w the machines synchronous speed

Que 2

Define the term blow hole in casting

→ When gases entrapped on the surface of the casting due to solidifying metal, a rounded or oval cavity is formed called blow wholes. These defects are always present in the cope part of the mold

2

Que 3 explain engineering materials briefly

engineering materials refer to the group of material that are used in the construction of manmade structure and component. The primary function of an engineering material is to withstand applied loading without breaking & without exhibiting excessive deflection

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Que 4 Give defination of annealing process

→ The term annealing, until and unless specified means full annealing. The Heating temperature varies from 750 to 950°C, holding at this temperature followed by slow cooling

Que 5 state the term wire drawing process.

The wire drawing process consists of pointing the rod, threading the pointed end through a die and attaching the end to a drawing block.



Mid term – 2 (2022-23)

Q1 Create difference b/w flat belt and V belt drive.

Sol

	V-Belt	Flat-Belt
(1)	suitable for shorter center distances b/w the shafts	suitable for comparatively longer center distances
(2)	Trapezoidal section	Rectangular section
(3)	Frictional grip is more	Frictional grip is less
(4)	Velocity ratio is high	Velocity ratio is low
(5)	occurrence of slip is seldom possible	slip occurs easily

Q2 Explain working of gas welding and explain different types of flames generated in oxy-acetylene welding with suitable example

Sol Gas welding is the process of joining two metal piece by melting their edges by a flame resulting from the burning of a

igas fuel and oxygen. oxygen acetylene combination is the most widely used in this process. The process using the above combination is called as oxy-acetylene welding

oxy-acetylene welding —

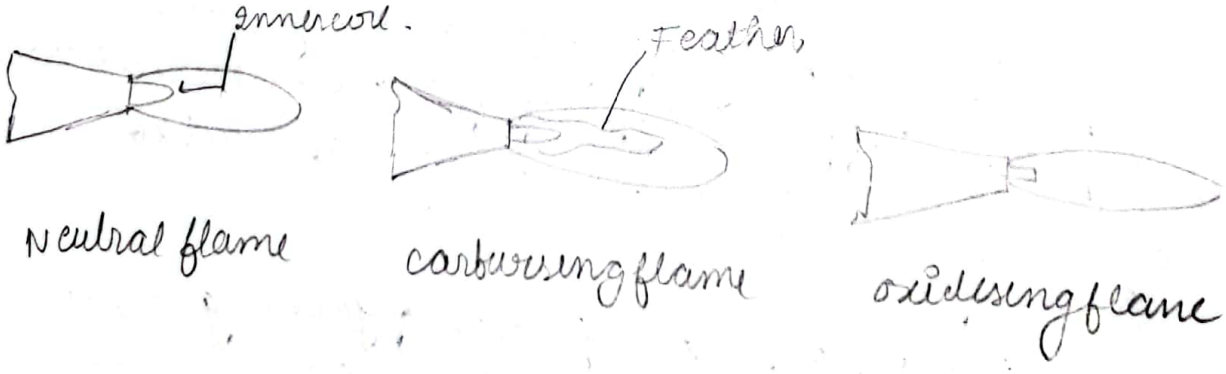
In oxy-acetylene welding, the flame is produced by burning a mixture of oxygen & acetylene. This mixture burns to produce the high flame temperature upto 3480°C in two stage reaction

$$C_2H_2 + O_2 \longrightarrow H_2 + 2CO$$

$$2CO_2 + O_2 \longrightarrow 2CO_2$$

$$2H_2 + O_2 \longrightarrow 2H_2O$$

This reaction occurs after the first combination zone. The oxygen for above two reaction is obtain from the atmosphere.



Q 9 write down difference b/w soldering & brazing.

Sol

Soldering	Brazing
These are the weakest joint of the three	These are stronger than soldering but also weaker than welding
Temperature required upto 450°C	It may go up to 600°C in Brazing
Workpieces do not need to be Heated	The work pieces is heated
The costs involved and the skill requirement is very low	The cost involved & the skills needed b/w the two others
No Heat treatments	No Heat treatment
Preheating the workpiece before Soldering is good for making good quality joint	Preheating is beneficial for forming a solid joint

Que 10 What is gear? Explain type of gear for transmission of power with suitable diagram.

A gear is a toothed wheel attached to a rotating shaft. There are many type of gear like spur gear, helical gear etc.

Spur gear :-

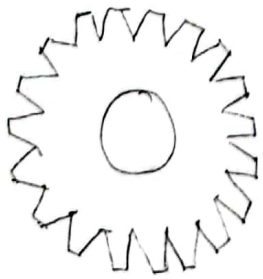
This is a simplest type of gear. It has parallel to the axis of rotation and is used to transmit rotation from one shaft to another parallel shaft

Helical Gear :-

This gear has its teeth inclined to the axis of rotation. Helical gears are also used for the same applications as spur gear one major advantage of Helical gear is its silent operation

Bevel Gears :-

These gears have their teeth formed on conical surface and are used for transmitting motion b/w two shafts at 90°



Spur gear



Helical gear



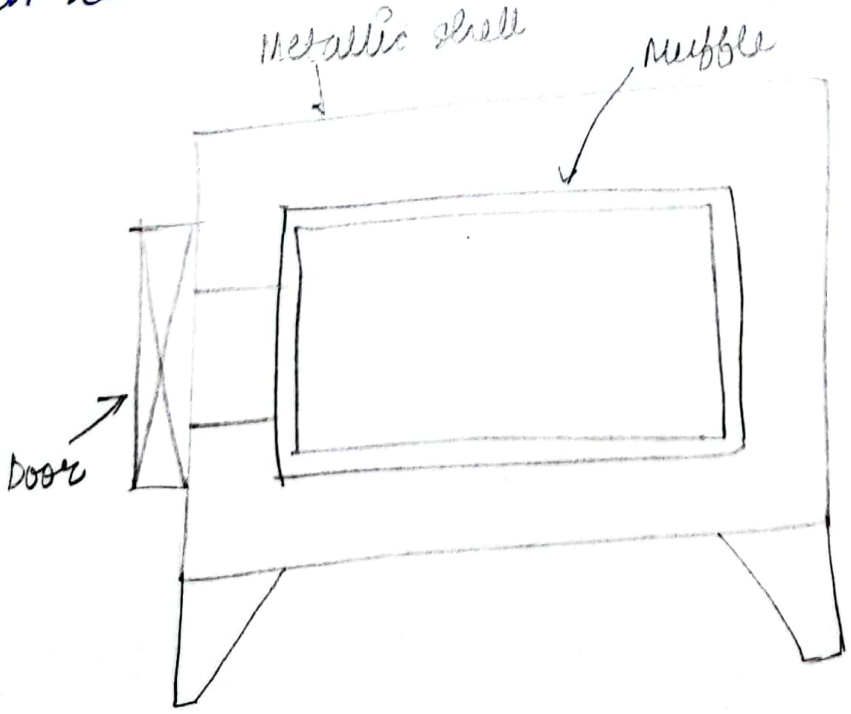
Bevel gear

Q.W.11 Describe the various methods of Heat treatment with the help of suitable diagram

Heat Treatment methods :-

(1) Muffle furnace :-

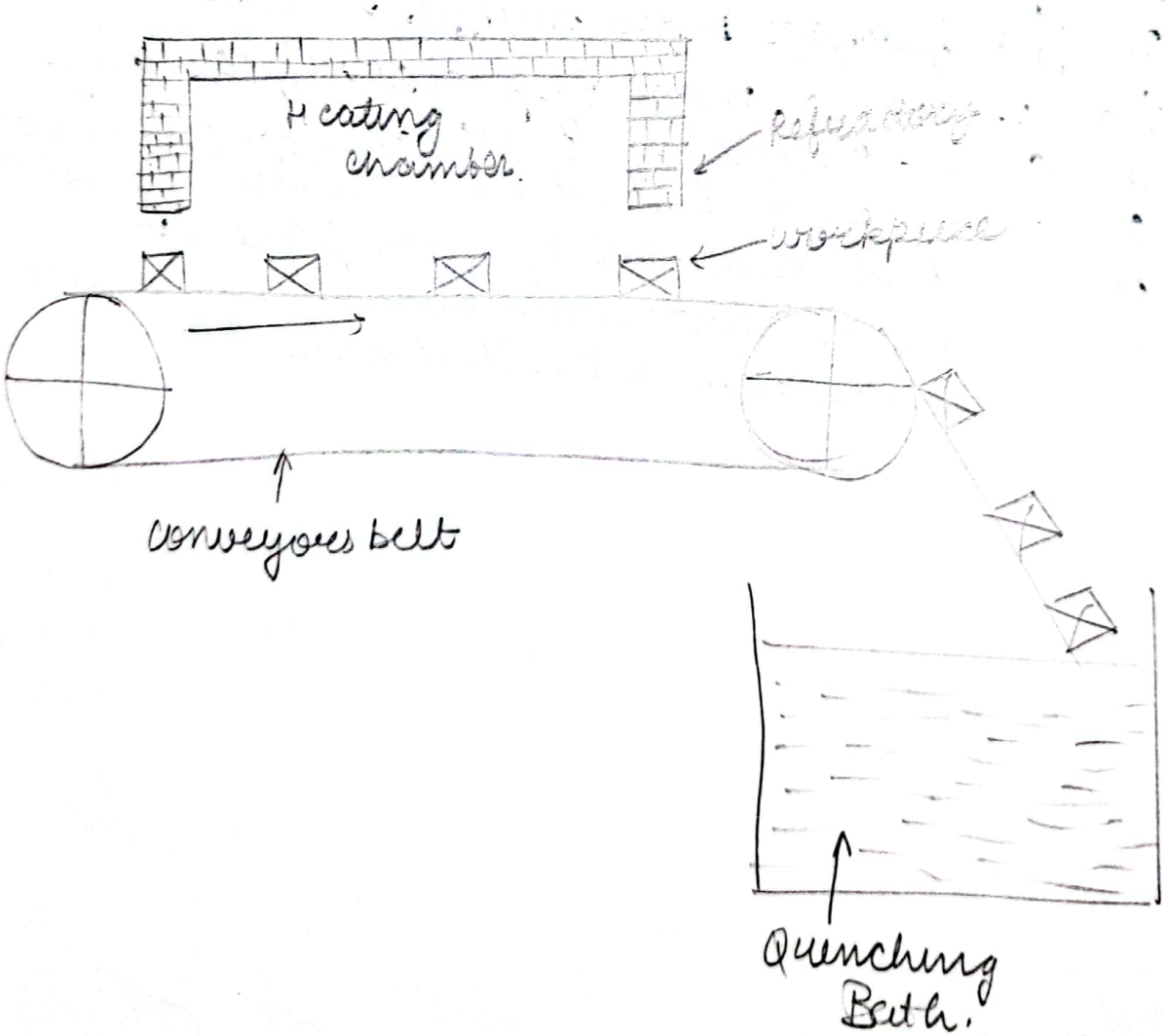
Muffle furnaces are charged and discharged through a front door opening and the bottom is exposed to hearth. The most important part of muffle furnace is the muffle which is a hollow cuboid. made of special refractory material. Electrically heated muffle furnaces are more popular and are extensively used for the heat treatment of small parts. Here the muffle is surrounded by heating element such as nichrome & kanthal wire



Conveyor furnace :-

This furnace is provided with a conveyor mechanism to carry the parts automatically through the furnace.

The speed of the conveying mechanism and closely controlled temperature zone of the furnace make possible any temperature time cycle. Such furnaces are suitable for on-line production provide a greater uniformly and are adaptable to a wide range of products



Q:12 Explain the following with neat sketch:-
1. Forging process
2. Rolling process

1) Ans:

Forging:

⇒ Forging is a metal forming process in which the product of desired shape and size is achieved by pressing or hammering. Forging is generally a hot working process, through cold forging is also used for some application. Forging is a step by step forming process to change the shape of the raw material to the finished form. Different operations or works that can be done by the forging process are detailed Below:-

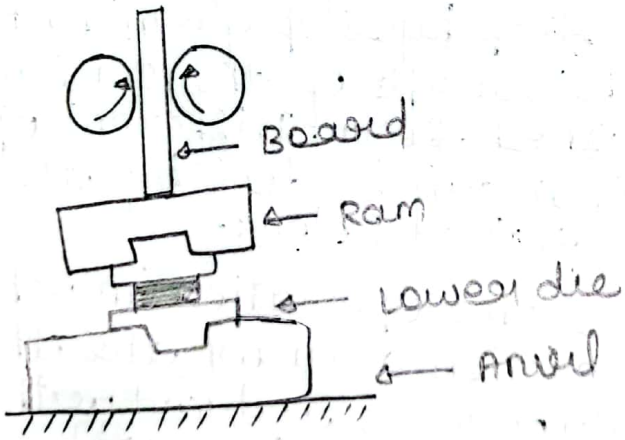
2) Drawing:- It is the operation in which the cross-section area or the thickness of the work piece is reduced with an increase in the length. This is done by striking the metal piece with flat dies.

Fullering:- It is similar to drawing, But this operation is carried out with a set of two fullers.

Edging :- It is a forging operation in which the edge of the raw material is changed to desired shape by pressing it between two dies.

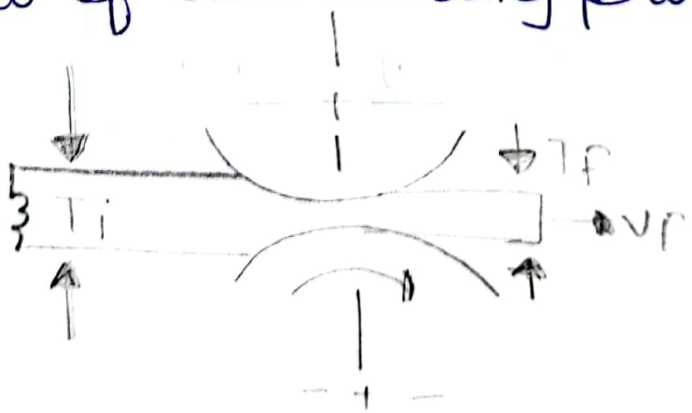
Bending :- It is an operation to Bend the work-piece as desired by using the fforant portion of the anvil suitably.

Upsetting :- It is forging operation in which the cross-sectional area or the thickness of the work piece is increased by hammering or pressing. The length of the work piece is decreased.



Rolling process:-

Rolling is a metal forming process which is achieved by passing the metal Between rotating rolls. Rolling is the most widely used in manufacturing process Because of its high productivity and low cost. Many shapes such as I, T, L and other complex sections are possible to be formed by the rolling process. In rolling high compressive forces are applied on the metal by means of the rotating rolls As a result, the cross-sectional area or the thickness of the metal is reduced with an increase in the length. The schematic view of the rolling process is given.



Vi - initial velocity
Vf - Final velocity

Ti - Initial thickness
Tf - Final thickness

Q13 Explain the various pattern allowlances used in foundary. Also explain different types of casting defects.

Pattern Allowlances:-

In the metal casting process, the pattern is used to manufacture a casting of the desired dimensions, But the pattern is not made dimensionally identical identical with the casting. The various reasons

The pattern are made with certain allowlances on size. The various patterns allowances include the following

1) Shrinkage Allowlance:-

shrinkage allowlance is the allowlance given on the pattern size for avoiding any change in the dimensions of the casting Because of the shrinkage of the metal during solidification.

Different metals shrink differently and have different shrinkage allowlances. shrinkage allowlances for important casting metals are given Below

Grey cast iron = 7 - 10.5mm/m
steel = 20mm/m.
Aluminium = 18mm/m

Finishing Allowlance or Machining Allowlance

⇒ The finishing or machining allowlance is the allowlance given on size of the pattern for finishing or machining the rough surface of the casting. The standard finishing allowlance for ferrous metal is 3mm and that for non-ferrous metal is 1·5mm.

Draft Allowlance or Taper allowlance

⇒ Draft allowlance is the taper allowed on vertical faces of a pattern for easy removal of the pattern without damaging the mould cavity surface as given. A draft of 3-6mm per metre is generally adopted.

Distortion or camber Allowlance

⇒ Due to internal stresses developed during cooling, the casting may be distorted. For example if the casting has a U-shape, it will tend to cool faster at the ends, giving rise to internal stresses in the Bent portion.

Shake Allowlance or Rapping Allowlance

For the easy withdrawal of the pattern from the moulding sand, the pattern is slightly rapped or shaked around the vertical faces which leads to a slight enlargement in the modual cavity.

Casting Defects

The most common type of defects in casting are as follows:-

Blow holes: Blow holes are cavities present inside the casting or on the surface of the casting. They are caused by the entrapped gases or steam in the casting. Because of the molten metal, gases are generated and the moisture present in the moulding sand accounts for the steam.

Pin holes

⇒ Pin holes are large number of small holes occuring on the surface of the casting. This is caused by hydrogen or carbon-monoxide picked up by the molten metal in the furnance or while transferring it for pouring.

Swell:- A swell is an enlargement of the mould cavity Because of the pressure exerted by molten metal.

Finishing Allowance

Shrinkage cavity:-

⇒ Shrinkage cavity is a void or depression caused by shrinkage of the metal. This may be avoided by adequate risers and by proper mould design.

Shift :-

Shift is caused when there is mismatch of the sections of a casting usually at parting line.

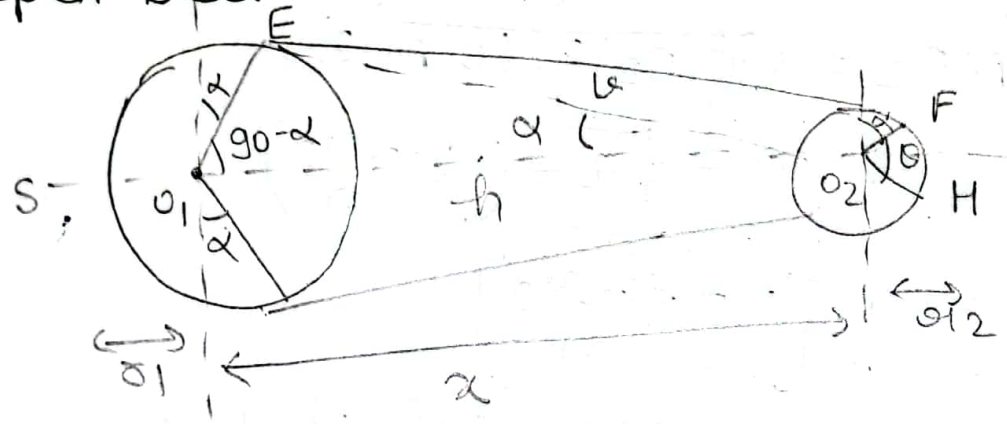
Drops: Drop caused by the falling of some loose moulding sand from the cope surface of the mould into mould cavity.

Runout:- A runout is caused by the leakage of the molten metal out of the mould cavity.

Cold shunts:-

A cold shut is caused by incomplete fusion of the molten metal steam while melting in the mould cavity.

Q14 Derive an expression for the length of open Belt drive.



Angle of contact $(180-2\alpha)\frac{\pi}{180}$

Let r_1 and r_2 = radii of larger and smaller pulley

x = distance b/w centres of two pulleys (i.e. O_1O_2)

L = total length of Belt.

Let the Belt leaves the larger pulley at E & G and the smaller pulley at F and H as shown in fig.

Let the angle $MO_2O_1 = \alpha$ radian

the length of the Belt L = arc GJE + EF + arc FKH + HG

$= 2$ (arc GJE + EF + arc FK) ①

From geometry ΔO_1O_2M

$$\sin\alpha = \frac{O_1M}{O_2O_1} = \frac{O_1E - EM}{O_1O_2} = \frac{r_1 - r_2}{x}$$

$$\alpha = \frac{\vartheta_1 - \vartheta_2}{x}$$

Arc $JE = \vartheta_1(\pi/2 + \alpha)$ — ③

Similarly, Arc $AC = \vartheta_2(\pi/2 - \alpha)$ — ④

and $EF = MO_2 = \sqrt{(O_1O_2)^2 - (O_1M)^2}$

$$n = \sqrt{L - \left(\frac{\vartheta_1 - \vartheta_2}{n}\right)}$$

$$EF = n\left[1 - \frac{\vartheta_1 - \vartheta_2}{n}\right]$$

Now, expanding by Binomial theorem

$$EF = n\left[1 - \frac{1}{2}\left(\frac{\vartheta_1 - \vartheta_2}{n}\right)^2 + \cdots\right]$$

$$= n - \frac{1}{2}(\vartheta_1 - \vartheta_2)^2 - \cdots$$

$$L = 2(\text{Arc}JE + EF + \text{Arc}FK)$$

$$= 2\left[\vartheta_1\frac{\pi}{2} + \vartheta_1\alpha + n - \frac{(\vartheta_1 - \vartheta_2)^2}{2n} + \vartheta_2\frac{\pi}{2} - \vartheta_2\alpha\right]$$

$$= \pi(\vartheta_1 + \vartheta_2) + 2\alpha(\vartheta_1 - \vartheta_2) + 2n - \frac{(\vartheta_1 - \vartheta_2)^2}{n}$$

$$= \pi(\vartheta_1 + \vartheta_2) + 2\left(\frac{\vartheta_1 - \vartheta_2}{x}\right)\cdot(\vartheta_1 - \vartheta_2) + 2x - \frac{(\vartheta_1 - \vartheta_2)^2}{n}$$

$$= \pi(\vartheta_1 + \vartheta_2) + \frac{\vartheta_1 - \vartheta_2^2}{n} + 2n \quad \text{— Ans}$$

Q15 Find the power transmitted by a belt running over a pulley of 60cm diameter at 200 rpm. The coefficient of friction B/w the Belt and pulley is 0.25. Angle of lap is 160° and max tension in Belt is 2500N.

D_1 = Diameter of the driver

$\Rightarrow 600mm = 0.6mN_1$

Speed of the driver in RPM = 200RPM

μ = coefficient of friction

= 0.25 θ = angle of contact

$= 160° = 1600\left(\frac{\pi}{180}\right) = 2.79$ rad

Angle of lap is always less than 10° so it is angle of contact which is always greater than 150°, always in radian

T_1 = maximum Tension = 2.5 RN Pet

T_2 = Tension in the slack side of the Belt

V = velocity of the Belt in m/sec =

$\pi DN/60$ m/sec

D is in meter & N is in RPM

P = Power transmission by Belt drive

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Finishing Allowance on M

We know that

$P \cdot T = (T_1 - T_2) \cdot V$ kW, T_1 & T_2 in kN

Here, T_2 & V is unknown

Calculation for V

$V = \pi DN/60$ m/sec

D is in meter, & N is in RPM

Putting all the value

$$V = \frac{3.104 \times 0.6 \times 200}{60} = 6.28 \text{ m/sec} \quad \text{---(1)}$$

calculating for T_2

we know that

Ratio of Belt tension $= \frac{T_1}{T_2} = e^{H\theta}$

Putting the value

$$\frac{2.5}{T_2} = e^{(0.25 \times 2.79)}$$

$$T_2 = 1.24 \text{ kN}$$

Now, $P = (2.5 - 1.24) \times 6.28$

$P = 7.92$ kW

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

B.TECH. (I Semester) SECOND MID TERM EXAMINATION 2022-23 Roll No.....

Code: 1FY3-07 Category: PCC Subject Name–BASIC MECHANICAL ENGNEERING (BME)

BRANCH-ALL BRANCH

SET A

Max. Time: 2 hrs. Course Credit: 02

Max. Marks: 60

NOTE:- Read the guidelines given with each part carefully.

Course Outcomes (CO):

At the end of the course the student should be able to:

CO1: Students will be able to retrieve basic concepts of thermal and manufacturing process. (Recall/Remembering).

CO2: Students will able to compare different types of thermal and manufacturing processes and. (Understand)

CO3: Students will able to annotating about the functioning of turbine & pumps, IC engines, refrigeration system, modes of transmission of power, materials and primary manufacturing process. (Apply)

CO4: Student will be able to appraise the fundamental knowledge of thermal engineering, in addition to understanding of power transmission to solve the industrial and societal issues. (Examine)

	PART - A: (All questions are compulsory) Max. Marks (10)				
		Marks	**CO**	**BL**	**PO**
Q.1	What is Slip?	2	1	1	1
Q.2	Define the term Blow holes in the casting.	2	1	1	1
Q.3	Explain Engineering materials briefly.	2	1	1	1
Q.4	Define Annealing process.	2	1	1	1
Q.5	State the term wire drawing process.	2	1	1	1
	PART - B: (Attempt 4 questions out of 6) Max. Marks (20)				
Q.6	What is the difference between the flat belt and v belt drive?	5	2	2	1
Q.7	Explain the working of gas welding and also explain different types of flames generated in oxy-acetylene welding with suitable diagrams.	5	3	3	1
Q.8	What is the extrusion process? Explain different types of extrusion process with a suitable diagram?	5	3	3	1
Q.9	Write down the difference between soldering and brazing.	5	2	2	1
Q.10	What is Gear? Explain different types of gear for the transmission of power with a suitable diagram.	5	3	3	1
Q.11	Describe the various methods of heat treatment with the help of suitable diagrams.	5	3	3	1
	PART - C: (Attempt 3 questions out of 4) Max. Marks (30)				
Q.12	Explain the following with a neat sketch:	10	3	3	1

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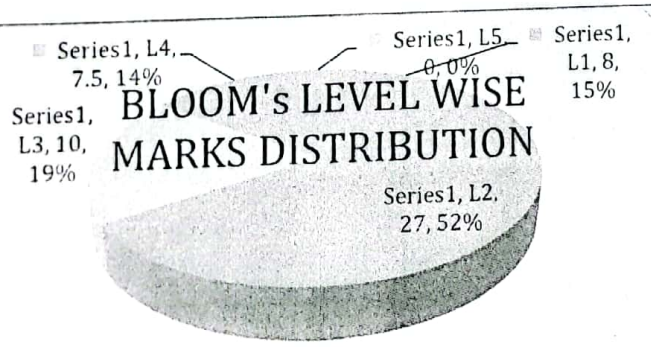
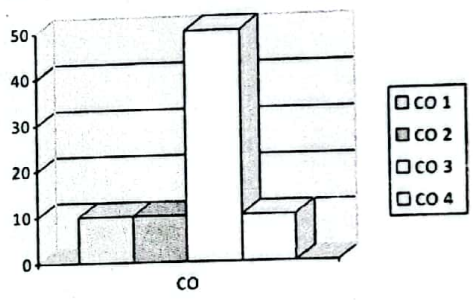
	1. Forging process 2. Rolling process				
Q.13	Explain the various pattern allowances used in the foundry. Also explain different types of Casting defects.	10	3	3	1
Q.14	Derive an expression for the length of the open belt derives.	10	3	3	1
Q.15	What do you understand by a gear train? 2 kW of power is transmitted by an open belt drive. The linear velocity of belt is 2 m/s. The angle of lap on the smaller pulley is 160^0. The coefficient of friction is 0.25. Determine the effect on power transmission in the following cases: a. Initial tension in the belt is increased by 8% b. Initial tension in the belt is decreased by 8% c. Angle of lap is increased by 8% by the use of an idle pulley for the same speed and the tension on the tight side Coefficient of friction is increased by 8% by suitable dressing to the friction surface of belt.	10	4	4	2





BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analyzing, 5 – Evaluating, 6 - Creating)

CO – Course Outcomes; PO – Program Outcomes

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Important Question Unit 2

		Marks	CO	BL	PO
Q.1	Describe the classification of IC engines?	2	CO3	L3	PO1
Q.2	Differences between petrol and diesel engine.	2	CO2	L2	PO1
Q.3	What is compression ratio? Explain the main component of IC engines?	2	CO3	L3	PO1
Q.4	State basic difference between 2 stroke and 4 stroke engines.	2	CO2	L2	PO1
Q.5	What is pump? What is priming?	2	CO1	L1	PO1
Q.6	Explain the specific function of fuel pump and injector in diesel engine	2	CO3	L3	PO1
Q.7	State basic difference between 2 stroke and 4 stroke engines.	2	CO2	L2	PO1
Q.8	Explain the working of reciprocating pumps with neat diagram.	2	CO3	L3	PO1
Q.9	An engine working on air standard Otto cycle has a cylinder diameter of 10 cm and stroke length of 15 cm. The ratio of specific heats for air is 1.4. If the clearance volume is 196.3 cc and the heat supplied per kg of air per cycle is 1800 kJ/kg, then work output per cycle per kg of air is.	2	CO4	L4	PO2
Q. 10	We want to discharge water from lower head to a limited height but we need high discharge, so which type of pump we can use explain with proper working.	2	CO3	L3	PO1

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Unit-2 Pumps & Engine

Important Question

Q.1. Describe the Classification of IC Engines?

Ans: IC engines can be classified as follows :-

1. According to the type of fuel used :-
   a) Petrol Engine b) Diesel Engine
2. According to the Cycle of operation :-
   a) Four Stroke Cycle Engine.
   b) Two Stroke Cycle Engine.
3. According to the Cooling System
   a) Air Cooled Engine.
   b) water Cooled Engine.
4. According to the Charged Pressure
   a) Naturally aspirated Engine.
   b) Supercharged / Turbocharged engine for high Capacity.

Q.2. what is Pump? what is Priming?

Ans: Pump :- It is a device which is having wide application in pumping of water, fuel, chemical, viscous fluid like Lubricant.

Priming :- It is the process in which the impeller of a Centrifugal pump is fully Submerged into the liquid without any air trap inside.

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Q.3. Explain the specific function of fuel pump and injector in diesel Pump ?

Ans: Fuel Pump: The pump produces the high pressure necessary for injection, in the order of 100-400 bar, depending upon the engine size and the type of Combustion Chamber used.

It Consists of Plunger working in a barrel. The Plunger is moved up against the action of spring by means of a Cam. During the upward movement of the plunger, when the inlet and spill ports are Closed, Pressure is developed in the fuel and is Sent to the injector through a delivery valve.

Fuel Injector: The lower portion of the fuel injector is described. The needle valve is kept in the seat by a helical spring. The tension of spring can be adjusted manually by a nut on the top of the injector to vary the pressure of injection.

Fuel under pressure from the fuel pump enters the pressure Chamber through the fuel duct. Because of high pressure the needle valve is lifted up against the spring tension.

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Q.4: We want to discharge water from lower head to a limited height but we need high discharge, so which type of pump we can use. Explain with proper working.

Ans: For this work we can use Centrifugal Pump.

The main parts of Centrifugal Pump are:-

1.) Impellers.
2.) Casing.
3.) Suction pipe fitted with a float valve (one way valve) and filter, the foot valve will not allow the water to come down.
4.) Delivery Pipe.

i) Impeller :- The impeller is a metallic disc fitted with a no. of Curved Vanes. Initially water will be poured inside the Casing and the process is called Priming. So, after priming, the impeller will be immersed in water inside the Casing. When the impeller is rotated by an electric motor or an engine, it will produce Centrifugal force due to which K.E or Velocity Energy will be produced in the water.

ii) Casing :- The Casing surrounds the impeller. The area between the impeller and Casing is gradually increasing till the delivery pipe. Due to the reduction in K.E the pressure

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Energy of water is increased. The following three types of casing are normally used.

- Volute Casing :- The gap between the impeller and Casing is increased. However the size of the Casing will be small and the cost will be less.

Q. 5

Ar

- Vortex Casing :- The space between the impeller and the casing is increased by introducing a circular chamber. As eddies are reduced the efficiency of the pumps with the vortex casing is increased.
- Casing with Guide Vanes or Diffuser Casing :- The impeller is surrounded by a set of guide vanes or diffuser. The shape of the guide vanes should be carefully designed to ensure that the water flow from the impeller enters the guide vanes without shock. Gradual increase in area of guide vanes reduces the velocity of flow resulting in pressure increase.

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Q.5. What is the Compression ratio? Explain the main Component of IC Engine?

Ans: The Compression ratio is defined as $\frac{V_s + V_c}{V_c}$, where V_s is the Stroke volume and V_c is the Clearance volume.

- Main Components of IC Engines:-

i) Cylinder :- The Cylinder allows the piston to move to and fro. It is made of Cast iron or steel or aluminium alloy.

ii) Cylinder head :- It is fitted on the top of Cylinder. It also accomodates the inlet valve and the Spark plug.

iii) Piston :- It transmits the force exerted by the burning gases to the Connecting rods and finally to the Crank Shaft. The diameter of piston in a large marine engine is about 1m.

iv) Piston Rings :- Two different types of Piston rings are housed in the Circumferential grooved provided on the outer Surface of the piston. The function of the lower rings is to Scrap the used lubricating oil into the Crank Case. These rings are called Scraper rings.

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v) Connecting Rods :- This transmits the force from the piston to the Crank shaft. It also helps in Converting the reciprocating motion of the piston into the rotatory motion.

vi) Crank Shaft :- Great Care should be taken in the proper design of the Crank shaft. The Crank shaft is provided with suitable holes to help in the lubrication system.

vii) Flywheel :- It is mounted on the crank shaft. The flywheel Stores the excess energy during the power Stroke of the engine and helps the movement of piston during the remaining idle strokes.

viii) Cams :- Properly designed Cams Control the opening and closing of the inlet and exhaust valves in the Case of four-stroke engines.

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Q.6. State basic difference between 2-stroke and 4-stroke Engines.

Ans:-

4-Stroke Engine	2-Stroke Engine.
i) One working stroke for every 4 strokes or 2 revolution	i) One working stroke for every 2 stroke or one revolution.
ii) As the no. of cycles is less power output is less for the same cylinder size.	ii) Power is more for the same cylinder size. More suitable for a diesel power plant.
iii) The weight of the engine is more for the same output power.	iii) The weight of the engine is considerably less. So, it is more suitable for a marine engine.
iv) Operating temperature is less. So, less consumption of lubricating oil.	iv) Operating temperature is more so, more consumption of lubricating oil. Special piston cooling is necessary in large engine
v) Variation of torque is more So, heavier flywheel is necessary.	v) Smaller flywheel is enough as the torque is more uniform.
vi) Noise is less.	vi) Noise is more due to frequent exhaust.
vii) Straight piston is used	vii) Deflector piston is used.

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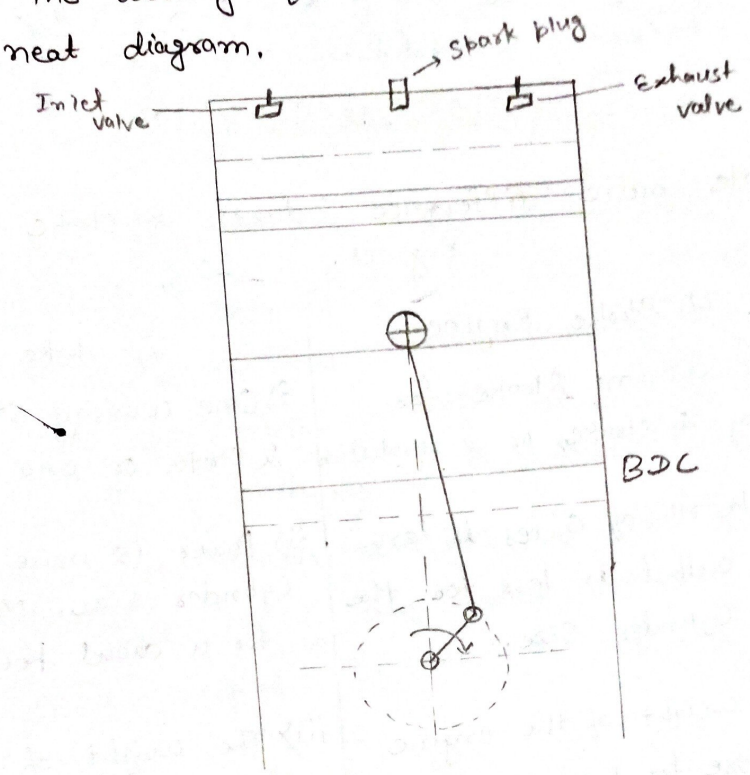
Q. 7. Explain the working of four-stroke, petrol engine with neat diagram.

Ans :-



i) Suction Stroke :- Inlet → open, Outlet → close.

During this stroke, the inlet valve is kept opened and the exhaust valve is closed. The piston comes down to the bottom dead centre (BDC) from the (TDC). Petr- air mixture in the correct proportion from the Carbur-etter is drawn inside the engine cylinder through the inlet valve.

ii) Compression Stroke :- Inlet → close, Outlet → close.

In this stroke, both the inlet and exhaust valves are kept closed. The mixture of petrol-air is compressed when the piston moves up to (TDC).

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The Compression ratio varies from 7-10 bar for petrol engines. The ratio between the cylinder volume before Compression to the volume after compression is known as the Compression ratio. At the end of the Compression stroke, a spark is produced at the spark plug due to which Combustion starts resulting in high pressure and temperature which are Comparatively less than that of a diesel engine.

iii) Working or Power Stroke :- Both valve closed during their stroke, both valves are kept closed. The piston is pushed down from TDC to BDC. The force above the piston is transmitted to the Crank Shaft through the Connecting and Crank mechanism.

iv) Exhaust Stroke :- Inlet → Close, Outlet → Open.
During the stroke, the exhaust valve is kept opened and the inlet valve is kept closed. The piston moves up from BDC to TDC. The waste gases are sent out through the exhaust valve and the cycle is repeated.

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Q.8. Difference between Petrol and Diesel Engines:-

Ans:

Petrol Engines	Diesel Engines.
i) Compression ratio is 7-10.	i) Compression ratio is 15-20.
ii) Petrol-air mixture is Compressed.	ii) Only air is Compressed.
iii) Compression pressure is 15-20 bar.	iii) Compression pressure is 30-40 bar.
iv) Compression temperature is about 400°C.	iv) Compression temperature is above 500°C.
v) Peak pressure is in the range of 50-70 bar.	v) Peak pressure is high in the range of 80-100.
vi) Weight of Engine is less.	vi) Weight of engine is more.
vii) Cast of Engine is less.	vii) Cast of Engine is more.
viii) Due to low peak pressure thickness of parts is less.	viii) Due to high peak pressure thickness of parts is more.
ix) Spark plug is necessary to ignite the fuel-air mixture.	ix) No need for Spark plug as Compression temperature is enough to ignite.
x) Thermal efficiency is low in range of 20-25% due to low Compression ratio.	x) Thermal efficiency is high in range of 25-30 % due to high Compression ratio.

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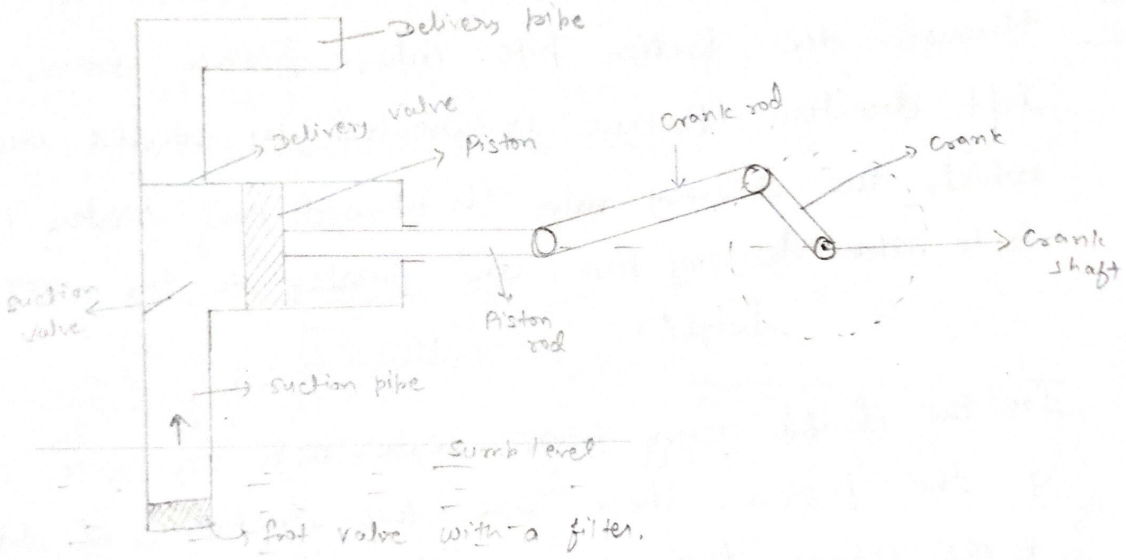
Q.9. Explain the working of reciprocating pumps with neat diagram.

Ans:- * Single Acting Reciprocating Pumps:-



i) Cylinder with a piston.

ii) Piston rod, Connecting rod, Crank and Crank shaft.

iii) Suction pipe, with a foot valve and filter.

iv) Delivery pipe.

v) Suction pipe.

vi) Delivery valve.

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The Crank shaft is Coupled to an electric motor or a diesel engine. when the motor or engine is Started, the piston moves to and fro inside the cylinder. when the piston moves right in the direction of arrow a vacuum will be produced in the cylinder due to which the Suction valve opens and the water is Sucked up from the pump and enters the cylinder through the Suction pipe. when piston moves in the left direction, Pressure is created in water due to which the delivery valve is opened and water is forced into the delivery pipe. and finally to the required height.

In the double acting pump, water acts on both sides of the piston. There are two Suction and delivery pipes. when there is a Suction Stroke on one side of the piston. Thus, for each revolution of the Crankshaft there will be two delivery Strokes and So, double the amount of water is delivered by this type of pump.

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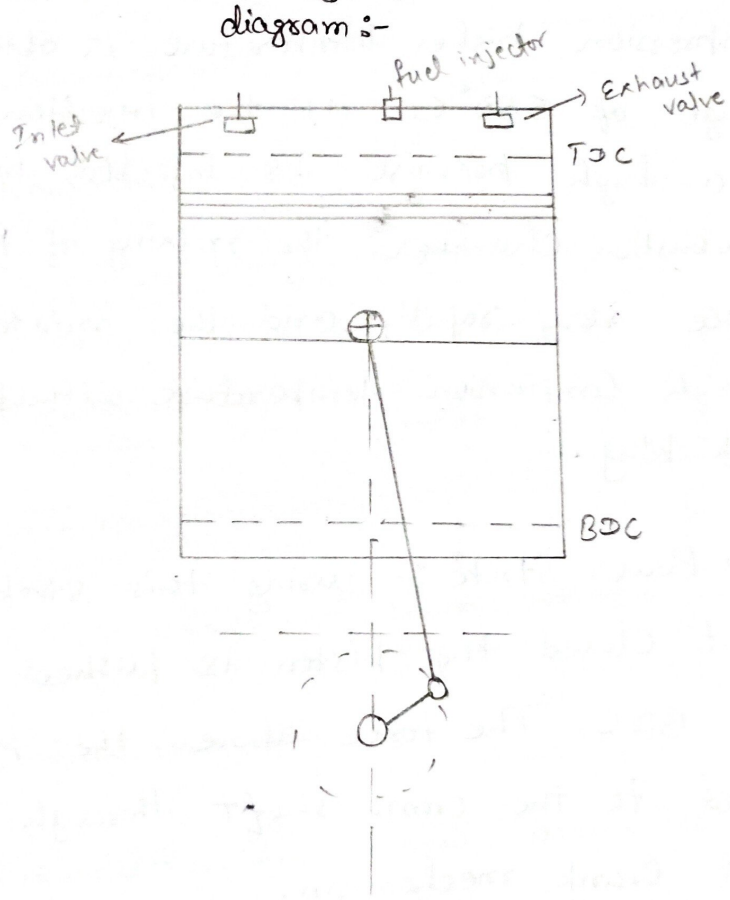
Q.10. Explain the working of 4-stroke diesel engine with diagram :-

Ans :-



In diesel Engine there is no need of spark plug. Diesel engines are also called Compression ignition engines.

i) Suction Stroke :- During this stroke, the inlet valve is kept opened and the exhausted valve is kept opened and the piston comes down to the bottom dead centre from the TDC.

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ii) Compression Stroke :- In this stroke, both the inlet and outlet valves are kept closed. The air is compressed when the piston moves up to TDC. The compression ratio moves from 15-20 for diesel engines. Due to high compression higher temperature is obtained in the range of 550°C. At the injection diesel oil at a high pressure is injected inside the hot combustion chamber, the mixing of fuel and air takes place very rapidly and the mixture is ignited due to high compression temperature without the help of spark plug.

iii) Working or Power Stroke :- During this stroke both valve are kept closed the piston is pushed down from TDC to BDC. The force above the piston is transmitted to the crank shaft through the connecting rod and crank mechanism.

iv) Exhaust Stroke :- During this stroke, the exhaust valve is kept opened and the inlet valve is kept ~~open~~ closed. The piston moves up from BDC to TDC. The waste gases are sent through the exhaust valve and the cycle is repeated.

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Important questions Unit 2

		Marks	CO	BL	PO
Q.1	What are the functions of carburettor?	2	CO3	L3	PO1
Q.2	Explain different terminology used in internal combustion engines.	2	CO2	L2	PO1
Q.3	Describe the working of 4 stroke SI engine.	2	CO3	L3	PO1
Q.4	Write about performance parameters of IC engine?	2	CO2	L2	PO1
Q.5	What are the functions of Fuel injection system for C.I. engines?	2	CO1	L1	PO1
Q.6	Explain the specific function of fuel pump and injector in diesel engine	2	CO3	L3	PO1
Q.7	Describe water cooling and its differences with air cooling.	2	CO2	L2	PO1
Q.8	What is the use of thermostat valve in the case of radiator cooling system?	2	CO3	L3	PO1
Q.9	What is an air standard cycle/ why such cycles are used?	2	CO3	L3	PO3
Q. 10	Calculate the ideal air standard cycle efficiency based on the Otto cycle in a petrol engine witha cylinder bore of 55mm,a stroke of 80mm,and a clearance volume of 23.3 cm3. Use the information form this compression ratio to calculate :Pressure and temperature at a beginning compression process is 101 kN/m2 and 870C. Temperature at the beginning of an expand process is15020C. Calculate the temperature and pressure at the important points based on the Otto cycle.	2	CO4	L4	PO2

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Unit-3 important Questin

RAC

Q1 Define refrigeration? Define ton of refrigeration?

As It is the science of providing and maintaing the temperature below that of surrounding atmosphere.

Ton → cooling capacity of an air conditioner or refrigerator equal to 12000 british thermal units per, 200 BTU per minute.

Q2 What are refrigerants? Explain desirable properties of refrigerants?

As A refrigerant is a working liquid used in the refrigeration cycle of air conditioning system.

→ A high thermal conductivity and low freezing point
→ High specific heat and high boiling point.
→ High specific heat and low specific volume.
→ High heat transfer coefficient and low latent heat.

Q3 Write down the difference between vapour compression and vapour absorption refrigeration system?

Vapour compression	Vapour absorption
(1) Smaller in size	(1) Very large in size for the same capacity

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(2) COP is higher	(2) COP is lower
(3) Maintenance cost is high.	(3) Maintenance cost is low
(4) System produces noise	(4) Silent in operation
(5) wear and tear will be more	(5) wear and tear is less

Q4 Explain vapour compression refrigeration system with the help of neat diagram?

As In vapour compression refrigerator the refrigerant is used which is circulated in system in which it alternately evaporates and condense thus it undergoes a change of phase.

For a closed cycle of refrigeration employing the condensable refrigerant vapour is required. for the activity, power is supplied to the motor connected to the compressor and it constitutes the major running cost of the system. the compress refrigerant vapour is led into the condensor. generally atmospheric pressure is blown over the condensor using a fan and it carries away the latent heat from the refrigerant vapour the refrigerant vapour is condensed into high pressure liquid refrigerant enters the expansion device which can be long spirally capillary tubes in small refrigerators. here the refrigerant throttled to low pressure low temperature wet vapour thus completing the cycle

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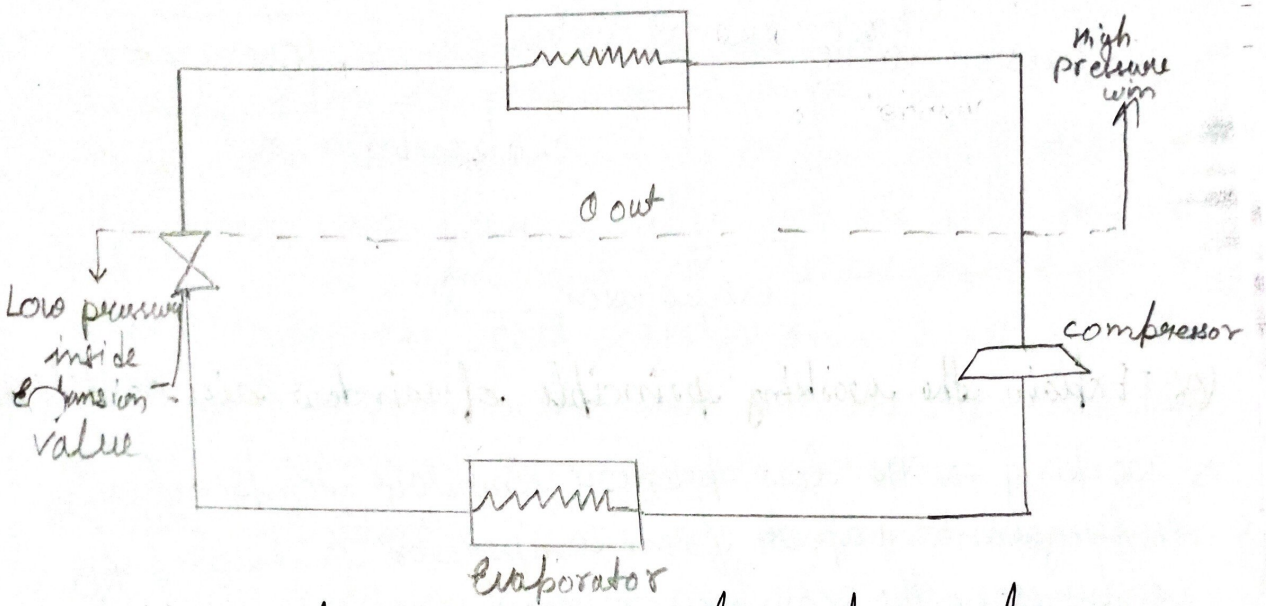

Q5: Explain vapour absorption refrigeration system.

A A vapour absorption refrigeration system is a kind of refrigeration in which after evaporation the vapour of refrigerant are absorbed in an absorber solution.

The simple VARS system consists of the following components.

(1) Absorber
(2) pump
(3) Generator
(4) condnsor
(5) evaporator
(6) Expansion valve
(7) Pressure relief valve.

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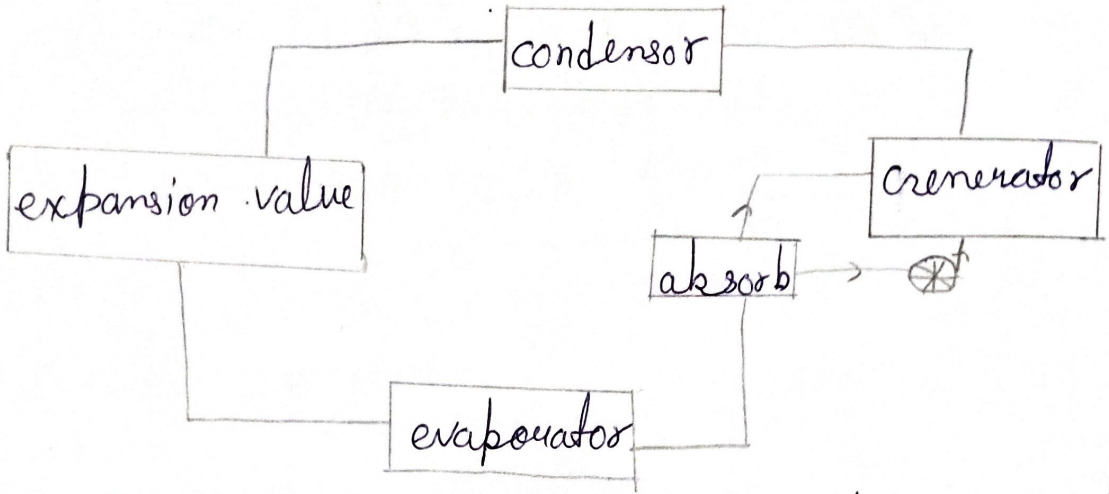
Vapour absorption refrigeration system



(Q6) Explain the working principle of window air conditioner

working → The low pressure and low temperature refrigerant vapour form evaporator is sucked by compressor. the compressor compress the vapour to high pressure and high temperature and discharge to the condensor. the refrigerant vapour is condensed by displacing heat to the cooling medium. the liquid refrigerant coming out of condensor passes through filter dryer into capillary tubes where it is again throttled back to the evaporated pressure. the low pressure, low temperature liquid refrigerant then flows to evaporator. It boil off by extracting heat from air to be circulated to the conditioned space

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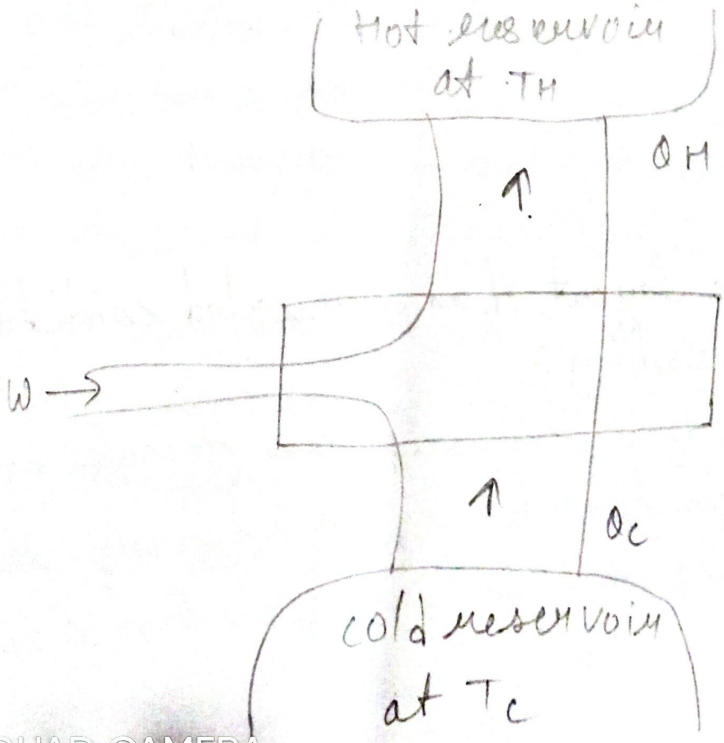
Principle :- As the temperature in the room rises it triggers the thermostat in the AC unit, which turn on the blower room air is pulled into the unit and moves over the cold refrigerant coil. the air cooled and it passes over the cold coils and is passes over the cold coils and is pushed out into the room cooling it and bringing down the temperature.

07 With neat diagram explain the working of refrigerator?

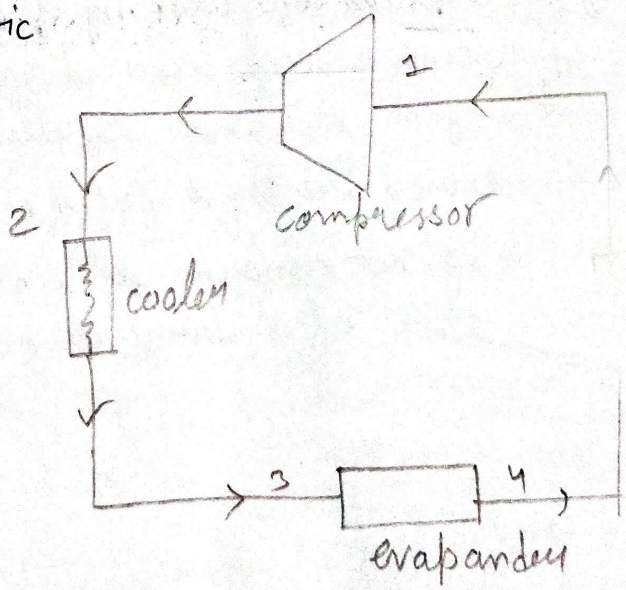
* A refrigerator performs a cycle in a direction opposite to that of a heat engine, the net resulting being absorption of some energy as heat from a reservoir at low temperature, a net amount of work done on the system and the rejection of a large amount



Energy flow diagram for a refrigeration of energy as heat to a reservoir at high temp^r, the working substance not undergoing the refrigeration cycle is called a refrigerant. the refrigerant is a saturated liquid at high pressure and at a low temp^r as can be obtained with air or water cooling

The refrigeration cycle comprises the following processes

① Throttling process
② Isothermal
③ Adiabatic



OR (8) Draw a schematic layout of an air cooled conditioner and explain its working?

As An air conditioning system is a process to make a particular place comfortable by maintaining the temperature, humidity and air purity within a limit

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Energy flow diagram for a refrigeration of energy as heat to a reservoir at high temp^r, the working substance not undergoing the refrigeration cycle is called a refrigerant. The refrigerant is a saturated liquid at high pressure and at a low temp^r as can be obtained with air or water cooling

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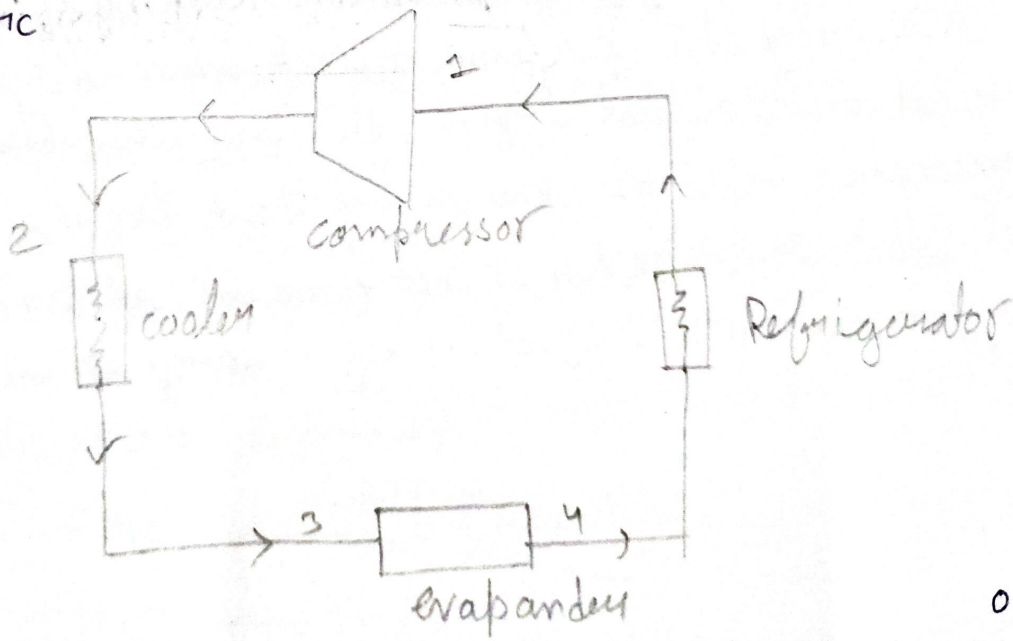

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08 B Draw a schematic layout of an air cooled conditioner and explain its working?

As An air conditioning system is a process to make a particular place comfortable by maintaining the temperature, humidity and air purity within a limit

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Working of air conditioner

An air conditioning system works on the principle of thermodynamics law and uses a vapour compression refrigeration system generally, an air conditioning system has a condensor coil, evaporator coil, compressor these all are connected in a closed ~~loop~~ loop system by pipeline and this pipeline is filled with compressed refrigerant. when the compressor is running condition the refrigerant is flowing conditiously the running condition the main function of the evaporator coil is to extract heat from the indoor air and transfered it to the refrigerant also it removes water particles from the air and drained them through the drained line. the main function of the condensor coil is to extract heat from the refrigerant and left it to outdoor air. thus the heat is removed from the indoor to outdoor air and the indoor space will be cattle caled the air conditioning system also has cooling fans to circulate the airflow and air fitters to remove the dust particles from the air.

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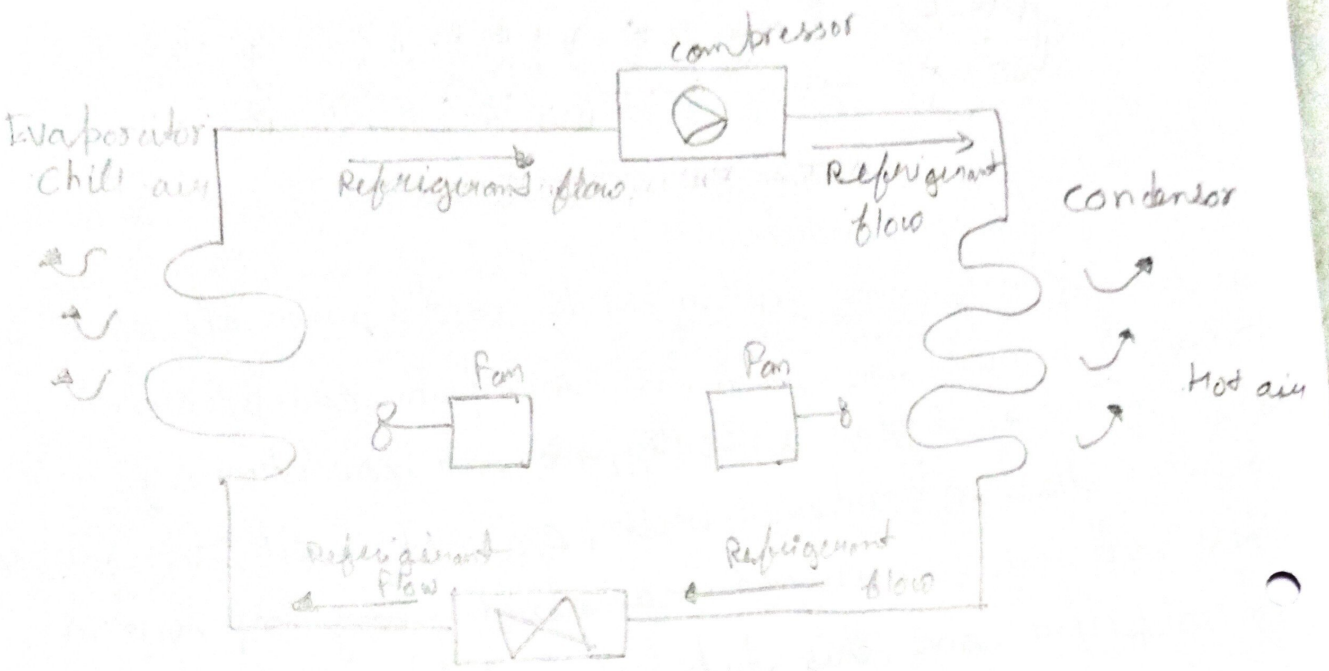

Q9 for heating purposes which kinds of machine we still use explain with suitable line diagram.

As In thermodynamics and engineering a heat engine is a system used to convert heat to mechanical energy which can be used to do mechanical work.

It takes heat from a resirvoir, then does some work like moving a piston, lifting weight etc. and findly discharges some energy into the sink

Expression :- $\eta = W\theta$; where W = work done by engine

$\theta_1 \rightarrow$ Heat taken from source

After each cycle, the engine return to its initial state & so $\Delta V = 0$, from fig it is clear that $W = \theta_1 - \theta_2$

Hence heat engine efficiency is $\eta = \frac{\theta_1 - \theta_2}{\theta_1}$

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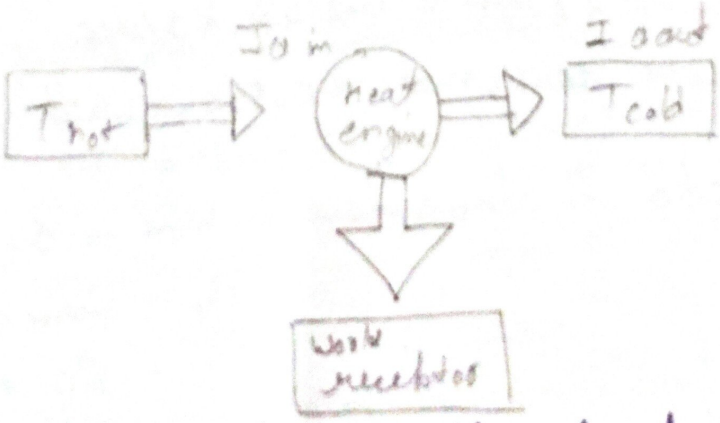
$$\eta = 1 - \frac{Q_2}{Q_1}$$

So for $Q_2 = 0$ efficiency will be 100% but in actual this is not possible because there will be some loss of energy in the system. hence for every engine there is a limit for its efficiency.

Types of engines :-

(1) External combustion engine (2) Internal combustion engine.



Example :- In everyday examples of heat engine include thermal power station, IC internal combustion engine, fire-alarms, refrigeration and heat pump.

A house hold refrigerator with COP of 1.8 removes heat from a refrigerated space at a rate of 90 kJ/min. determine a. the electrical power consumed 2. the heat rejected to surroundings.

COP = 1.8 heat refrigerated rate = 90 kJ/min

$$COP = \frac{Q_2}{W_{in}}$$

$$1.8 = \frac{90}{W_{in}}$$

$$W_{in} = \frac{90}{1.8}$$

$$= 50 \text{ kJ/min} = 0.833 \text{ kJ/sec}.$$

electric power consumed = 0.833 k watt

Heat rejected to atmosphere = $W_{in} = Q_1 - Q_2$

$$Q_1 = W_{in} + Q_2$$

$$= 50 + 90$$

$$Q_1 = 140 \text{ kJ/min}$$

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Important Question Unit 3

		Marks	CO	BL	PO
Q.1	Define refrigeration? Define ton of refrigeration	2	CO3	L3	PO1
Q.2	What are refrigerants? Explain desirable properties of refrigerants?	2	CO1	L1	PO1
Q.3	Write down the difference between vapour compression and absorption refrigeration system.	2	CO2	L2	PO1
Q.4	Explain vapour compression refrigeration system with the help of neat diagram?	2	CO2	L2	PO1
Q.5	Explain vapour absorption refrigeration system.	2	CO1	L1	PO1
Q.6	Explain the working principle of window air conditioner?	2	CO3	L3	PO1
Q.7	With neat diagram explain the working of refrigerator?	2	CO3	L3	PO1
Q.8	Draw a schematic layout of an air conditioner and explains it's working.	2	CO3	L3	PO1
Q.9	For heating purposes which kinds of machine we will use explain with suitable line diagram and examples?	2	CO1	L1	PO1
Q. 10	A house hold refrigerator with a C.O.P of 1.8 removes heat from a refrigerated space at a rate of 90 kJ/min. Determine: (1)The electrical power consumed (2) the heat rejected to surrounding.	2	CO4	L4	PO2

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Important questions Unit 3

		Marks	CO	BL	PO
Q.1	Explain the applications of air-conditioning.	2	CO3	L3	PO1
Q.2	•What is meant by dry air, moist air, dry bulb temperature, wet bulb temperature and relative humidity?	2	CO1	L1	PO1
Q.3	Write short note on comfort air conditioning.	2	CO2	L2	PO1
Q.4	Explain following (1) COP for heat pump and refrigerator (2) Unit of refrigeration and how is it defined	2	CO2	L2	PO1
Q.5	Explain vapour absorption refrigeration system.	2	CO1	L1	PO1
Q.6	Write short notes on eco- friendly refrigerants.	2	CO3	L3	PO1
Q.7	With neat diagram explain the working of refrigerator?	2	CO3	L3	PO1
Q.8	Draw a schematic layout of an air conditioner and explains it's working.	2	CO3	L3	PO1
Q.9	What are the advantages and disadvantages of thermo electric cooling?	2	CO1	L1	PO1
Q. 10	A heat pump delivers 10 kW of heat to a room maintained at 250 C and receives heat from reservoir at -100 C. If the actual coefficient of performance is 50% of that of an ideal heat pump operating between the same temperature limits, what is the actual power required in kW to run the heat pump..	2	CO4	L4	PO2

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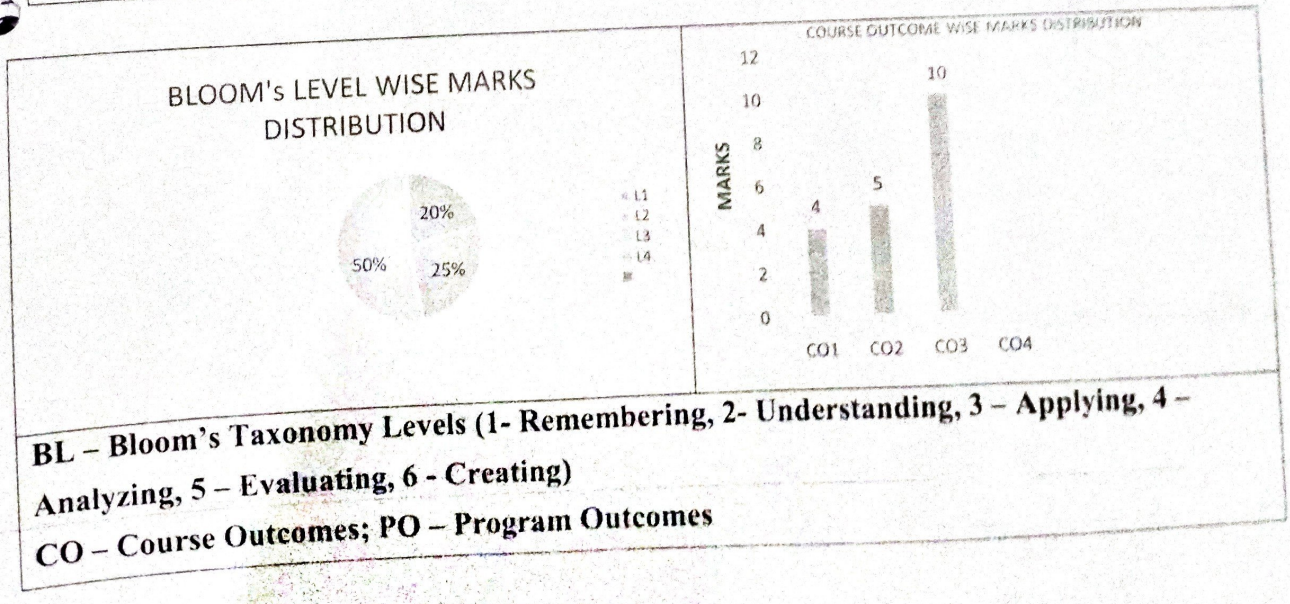
Important Question Unit 5, 6

			CO	BL	PO
Q.1	What is the effect of adding nickel and vanadium to steel?	2	CO1	L1	PO1
Q.2	What is engineering materials?	2	CO1	L1	PO1
Q.3	Classify the Engineering materials and explain the application and constituents of some of the important ferrous and non-ferrous materials.	2	CO2	L2	PO1
Q.4	Write down the difference between soldering and brazing.	2	CO2	L2	PO1
Q.5	Explain different properties of molding sand.	2	CO3	L3	PO1
Q.6	Explain the working of gas welding and explain different types of flames generated in oxy-acetylene welding with suitable diagram.	2	CO3	L3	PO1
Q.7	Explain different type of extrusion process.	2	CO3	L3	PO1
Q.8	Describe the various methods of heat treatment with the help of suitable diagram.	2	CO3	L3	PO1
Q.9	Explain the various pattern allowances used in foundry. Also explain different properties of molding sand.	2	CO3	L3	PO1
Q. 10	Suppose you want to manufacture a aluminum engine which manufacturing process you will adopt and why?	2	CO2	L2	PO1



BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analyzing, 5 – Evaluating, 6 - Creating)

CO – Course Outcomes; PO – Program Outcomes

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DETAILED LECTURE NOTES

Important Questn Unit-5 & 6
Engineering Materials

Ques-1 what is the effect of adding nickel and vandium to steel?

Ans-1 Adding nickel to steel increases the toughness, resistance to impact and corrosion, distortion and lower distortion in quenching.

Adding vandium provides a fine-grained structure over a wide range of temperature

Ques-2 what is engineering materials?

Ans-2 Material engineering is an engineering field of designing and improving materials and finding uses for materials in other fields and industries.

Ques-3 Classify the engineering materials

Ans-3 (1) Ferrous and non-ferrous materials and alloys
(2) Polymer materials
(3) Glasses and Ceramics

Metals and alloys are having immense application in construction words, electric power generation and transmission transportation, vehicles, agriculture, machine tools, etc.

Ques-4 Write down different properties of moulding sand.

Ans-4 ① Refractoriness - Ability to withstand high temperature

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(2) Strength: Moulding sand should have sufficient strength to retain the mould shape

(3) Flowability: Ability to get compacted to take up the required shape.

(4) Porosity: Moulding sand should be porous enough to allow the gases picked up by the molten metal

(5) Strength or cohesiveness: Ability of moulding sand grains to adhere each other.

(6) Adhesiveness: Property to adhere to the wall of moulding boxes

(7) Collapsibility: Readiness of the moulding sand to get collapsed.

(8) Durability: Ability to withstand the heating and cooling during repeated.

(9) Chemical resistivity: Ability to resist any chemical reaction

Ques-5 Write down the difference between soldering and brazing

Ans-5

Brazing	Soldering
(1) Used for joining dissimilar metals: pipes, copper, tubes, etc	(1) To make electrical connections to make printed circuit boards, joining light sheet metals, etc
(2) Melting temperature of the filler material is above 450°C	(2) Below 450°C

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(3) Fluxes are borax, fluorides etc.	(3) Zinc chloride
(4) Joint has a better strength	(4) Strength is comparitively less.

Ques-6 Explain the working of gas welding and explain different types of flames generated in oxy-acetylene welding with suitable diagram.

Ans-6 In oxy-acetylene welding, the flame is produced by burning a mixture of oxygen and acetylene. This mixture burns to produce the high flame temperature upto 3480° C in two stage reaction.

I^st stage:

$$C_2H_2 + O_2 \rightarrow H_2 + 2CO$$

This reaction occurs near the end of torch tip

IInd stage:

$$2CO + O_2 \rightarrow 2CO_2$$

$$2H_2 + O_2 \rightarrow 2H_2O$$

The oxygen for above 2 reactions is obtained from the atmosphere. Initially, the acetylene is supplied and it is

ignited with a friction spark / lighter. After this, oxygen is supplied with the help of a separate valve and the nature of flame is adjusted. A filler metal in the form of a rod is held in the flame and is melted to fill the weld cavity.

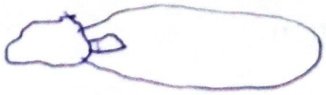
- Types of flame



(a) Natural flame



(b) Carburising flame (excess acetylene)



(c) Oxidising flame (excess oxygen)

Ques-7 Explain different types of extrusion process.

Ans 7 • Direct or forward extrusion:

In this, a block of metal is placed in a closed container. A die with a proper die holder is placed at one end of the container. A dummy block or pressure plate is placed at the end of ram. This is to avoid

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direct contact of the hot metal and the ram. In this, the direction of flow to the extruded metal is along the same direction of the ram movement.

- Indirect or backward extrusion:

In this a block of metal is placed in a closed container, fully closed by a closure plate. A hollow ram with a die is placed on the other end of the container. Extrusion is carried out by forcing the metal through the die orifice by driving the hollow ram. The direction of flow of the extruded metal is in the opposite direction of the ram movement.

Q1-8 Explain the pattern allowances used in foundary.

Ans-8 • Shrinkage allowances: It is the allowance given on the pattern side for avoiding any change of the metal during solidification

- Moulding allowances: It is given on the size of pattern for finishing the rough surface of the casting.
- Draft allowances: It is the taper allowed on vertical faces of a pattern for easy removal of the pattern without damaging the mould cavity.

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• Distortion or camber: Due to internal stresses developed during cooling, casting may be distorted. It is given to avoid this by intentionally defecting the leg inwards

• Shake or rapping allowances: For easy removal of the pattern from moulding sand, this allowances is given the shape of the pattern.

Ques-9 Describe the various methods of heat treatment with the help of suitable diagram.

Ans-9 The heat treatment methods are:

(1) Annealing
(2) Normalizing
(3) Hardening
(4) Tempering

1) Annealing: The heating temperature varies from 750-~~755~~c holding at this temperature followed by slow cooling.

2) Normalising: It is used for grain refinement and obtain uniform condition in material.

(i) Heating temp: varies from 750 - ~~955~~ 975°C

(ii) Holding the work piece for a short period and allowing it to air cool.

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3) Hardening: It is the process which is applied to almost all the tools and imp. machine parts. Its aim is to develop high hardness, increased tensile strength and wear resistance application.

(i) heating upto 750 - 975°C temperature.

Tempering: The conventional method of tempering consists of reheating the hardened steel to a range of temperature upto 400°C and holding it for a considerable time.

Ques-10 Suppose you want to manufacture a bike engine. Which manufacturing process will you adopt and why?

Ans-10 Bike engine can be manufactured by metal casting manufacturing process. We should adopt this process because bike engines have very complex shape. Different solid shapes on different sides. It can be prepared by too split method to design the bike engine. Materials used in manufacturing is cast iron, aluminium and aluminium alloys.

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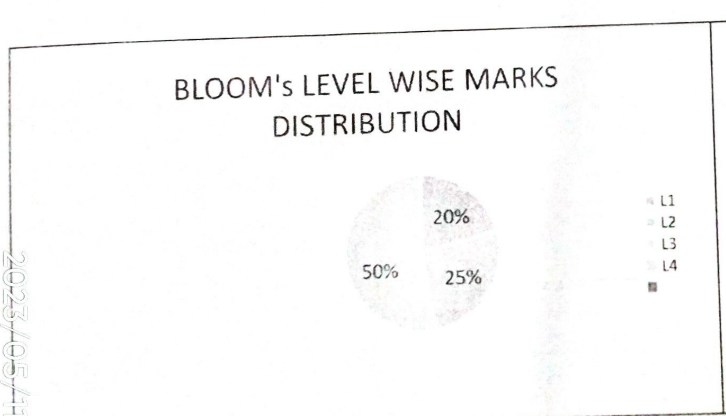
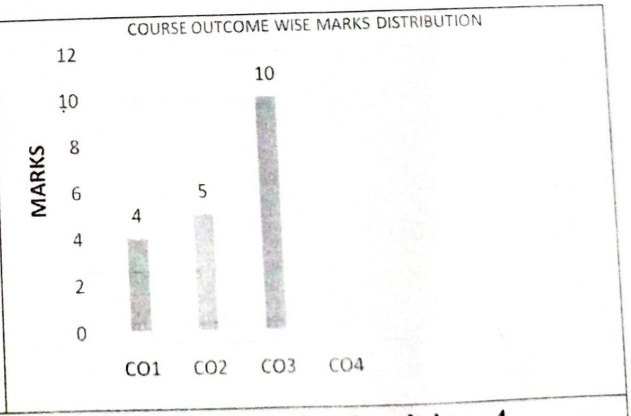
Important questions Unit 5, 6

			CO	BL	PO
Q.1	Enumerate some common casting defects and explain the reasons which cause these defects	2	CO1	L1	PO1
Q.2	Distinguish between welding, brazing and soldering. Which process produces the strongest joints and why?	2	CO1	L1	PO1
Q.3	What role has been played by materials in raising the standard of living of mankind?	2	CO2	L2	PO1
Q.4	What do you understand by forging? What are the advantages?	2	CO2	L2	PO1
Q.5	What are melting furnaces? Briefly describe a) Electric arc furnace b) induction furnace	2	CO3	L3	PO1
Q.6	Classify the Engineering materials and explain the application and constituents of some of the important ferrous and non-ferrous materials.	2	CO3	L3	PO1
Q.7	What is a Composite materials? Give some examples	2	CO3	L3	PO1
Q.8	What are the requisite properties in a good foundry sand?	2	CO3	L3	PO1
Q.9	Write and Explain different types of flames generated in ox acetylene welding with suitable diagram.	2	CO3	L3	PO1
Q. 10	Differentiate between brazing and soldering. Describe these Processes with their applications?	2	CO2	L2	PO1





BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analyzing, 5 – Evaluating, 6 - Creating)

CO – Course Outcomes; PO – Program Outcomes

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COLLEGE OF ENGINEERING

Zero Lecture

Session: 2023-24

Campus: PCE **Course: B.TECH.** **Class/Section: - D**

Name of Faculty: Dr Ankit Tyagi

Zero Lecture

1). Name of Subject: Basic Mechanical Engineering Code: 1FY3/2FY3-07

2). Self-Introduction:

a). Name: Dr Ankit Tyagi

b). Qualification: Ph D (Mechanical Engineering)

c). Designation: Associate Professor

d). Research Area: Additive Manufacturing

e). E-mail Id: ankit.tyagi@poornima.org

3). Introduction of Students:

a) ***Previous results:***

S. No	*Year*	*Result At PCE (in %)*
1.	2018-19	93%
2.	2019-20	92%
3.	2020-21	100%
4.	2021-22	96%
5.	2022-23	90%

b) *Name of 05 best students based on previous results:*

c) . Department Vision, Mission, PEOs, POs and PSOs:

Vision:-

Evolve as a centre of excellence with wider recognition and to adapt the rapid innovation in Computer Engineering.

Mission:-

1) To provide a learning-centered environment that will enable students and faculty members to achieve their goals empowering them to compete globally for the most desirable careers in academia and industry.
2) To contribute significantly to the research and the discovery of new arenas of knowledge and methods in the rapid developing field of Computer Engineering.
3) To support society through participation and transfer of advanced technology from one sector to another.

Program Educational Objectives (PEOs)

•Graduates will have good fundamental & multidisciplinary knowledge with an ability to analyze, design, innovate and handle the realistic problems.

•Graduates will possess ethical conduct, sense of responsibility to serve society and protect the environment.

•Graduates will have a strong foundation in academics, leadership qualities and lifelong learning for a prosperous professional career.

Program Outcomes (POs)

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

•Design, analyze and innovate solutions to technical issues in Thermal, Production and Design Engineering.

•Exhibit the knowledge and skills in the field of Mechanical & Allied engineering concepts.

•Apply the knowledge of skills in HVAC&R and Automobile engineering.

4). Instructional Language: - 60%English; 40% Hindi (English not less than 60%)

5). Introduction to subject: **-** Engineering Mechanics is a part of Physics. Which is quite useful for technical education in the following aspects? It is also relate to our day to day life activities as discuss in following manner:

a). ***Relevance to Branch****:* Basic mechanical Engineering are concerned with the concept of engineering physics, engineering mathematics and principle of materials for the analysis, synthesis, design and manufacturing of machine and its elements and maintain mechanical system. Mechanical engineering is the art of using problem-solving techniques and applying them to the design and manufacturing of an object. Essentially, a mechanical engineer uses creative design and analytical knowledge to turn a concept into something real.

b). ***Relevance to Society****:* - Basic mechanical Engineering plays a vital role for the society. Mechanical engineering is the art of developing new technologies in the field of manufacturing, designing, automobile, biomedical equipment's, construction, designing for human comfort condition and robotics. These technologies plays important role for the growth of society.

c). ***Relevance to Self****:* Every mechanical engineer should have a good knowledge of basic mechanical Engineering for study of design engineering, manufacturing and thermal engg. After the completion of course students will be able to serve their career in different sectors as well as in competitative exams like GATE, Engineering services etc. Basic mechanical engineering is the basic fundamentals of Mechanical Engineering.

d). ***Relation with laboratory:*** This subject provides theoretical knowledge base to the students and part of the subject is also covered in manufacturing practice workshop. In the workshop students will understand about the practical phenomenon about the topics taught in the lecture classes.

*e). **Connection with previous year and next year**:* There is no connection of this subject with previous year but it would be helpful in upcoming years.This subject provide efficient solutions to the development of processes and products, ranging from small component designs to extremely large plant, machinery or vehicles and can work on all stages of a product, from research and development to design and manufacture, through to installation and final commissioning.

f**). Significance of Gate:** Graduate Aptitude Test in Engineering (GATE) is an all-India examination being conducted and administered by the Indian Institute of Science and seven Indian Institutes of Technology. It is conducted by the National Coordination Board GATE, Department of Higher Education, Ministry of Human Resource Development, and Government of India. Clearing GATE is also eligibility to

(i) Higher Execution ME./M.Tech. (ii) Junior Research Fellowship in CSIR Laboratories (iii) PSU, & Many more.

Course Outcomes:

After the successful completion of course, students will able to:

i. 1FY3-07(CO1)	Students will be able to retrieve basic concepts of thermal and manufacturing process. **(Recall/Remembering)**
ii. 1FY3-07(CO2)	Students will able to compare different types of thermal and manufacturing processes and. **(Understand)**
iii. 1FY3-07(CO3)	Students will able to annotating about the functioning of turbine & pumps, IC engines, refrigeration system, modes of transmission of power, materials and primary manufacturing process. **(Apply)**
iv. 1FY3-07(CO4)	Student will be able to appraise the fundamental knowledge of thermal engineering, in addition to understanding of power transmission to solve the industrial and societal issues. **(Examine)**

6). Syllabus of Rajasthan Technical University, Kota

a). Index Terms/ Key Words:

S.No	Unit	Keywords
1.	1.	**Fundamentals, Steam Boilers, Steam Turbines and Power Plants**
2.	2.	**Pumps and IC Engines**
3.	3.	**Refrigeration and Air Conditioning**

4.	4.	**Transmission of Power**
5.	5.	**Primary Manufacturing Processes**
6.	6.	**Engineering Materials and Heat Treatment of Steel**

b). RTU Syllabus

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

1st Year - I Semester: B. Tech.

1FY3-07: Basic Mechanical Engineering

Credit: 2 **Max. Marks: 100 (IA:30, ETE:70)**

2L+0T+0P **End Term Exam: 3 Hours**

Unit No.	Contents	Hours
I	**Fundamentals:** Introduction to mechanical engineering, concepts of thermal engineering, mechanical machine design, industrial engineering and manufacturing technology. **Steam Boilers, Steam Turbines and Power Plants:** Introduction, classification and types of steam boilers and steam turbines. Introduction and Classification of power plants.	**15**
II	**Pumps and IC Engines**: Applications and working of Reciprocating and Centrifugal pumps. Introduction, Classification of IC Engines, Main Components of IC Engines, Working of IC Engines and its components.	**5**
III	**Refrigeration and Air Conditioning:** Introduction, classification and types of refrigeration systems and air-conditioning. Applications of refrigeration and Air-conditioning.	**5**

IV	**Transmission of Power**: Introduction and types of Belt and Rope Drives, Gears	**5**
V	**Primary Manufacturing Processes:** Metal Casting Process: Introduction to Casting Process, Patterns, Molding, and Furnaces. Metal Forming Processes: Introduction to Forging, Rolling, Extrusion, Drawing. Metal Joining Processes: Introduction to various types of Welding, Gas Cutting, Brazing, and Soldering.	**3**
VI	**Engineering Materials and Heat Treatment of Steel:** Introduction to various engineering materials and their properties.	**2**
	Total	**30**

c). **ABC analysis (RGB method) of unit & topics**

Category: Red-Tough, Green-Average, Black-Easy

Unit No.	Category A (Hard topics)	Category B (Topics with average hardness level)	Category C (Easy to understand topics)	Preparedness for "A" topics
1	Introduction, classification and types of steam boilers and steam turbines.	Introduction and Classification of power plants.	Introduction to mechanical engineering, concepts of thermal engineering, mechanical machine design, industrial engineering and manufacturing technology	Prepare of boiler diagram on paper for better learning.
2	Main Components of IC Engines, Working of IC Engines and its components	Applications and working of Reciprocating and Centrifugal pumps.	Introduction, Classification of IC Engines	Power point presentation.
3	Types and working of refrigeration systems and air-	Applications of refrigeration and Air-conditioning	Introduction and classification of refrigeration systems and air-conditioning	Video lecture.

	conditioning.			
4	Length of belt	Gear train	Introduction of power transmission devices	By lecture delivered and numerical practice.
5	Metal Forming Processes: Introduction to Forging, Rolling, Extrusion, Drawing	Metal Casting Process: Patterns, Molding, and Furnaces.	Introduction to Casting Process and joining process	Practically showed different steps of manufacturing process in mechanical workshop.
6	Heat treatment process	Properties of Engineering materials	Introduction of engineering materials	By lecture delivered.

7). Books/ Website/Journals & Handbooks/ Association & Institution:

a). Recommended Text & Reference Books and Websites:

S. No.	***Title of Book***	***Authors***	***Publisher***
Text Books			
T1	BasicMechanical Engineering	G.Shanmugam and S Ravindra	McGraw hill Publications
T2	BasicMechanical Engineering	A.K Rajvanshi	Genius Publications
T3	BasicMechanical Engineering	K Venu Gopal and Prabhu Raja	Anuradha agencies pub
Reference Books			
R1	Elementsof Mechanical Engineering	P.N Gupta	Standard Publisher
R2			
R3			
Websites related to subject			
1	*www.nptel.co.in*		

2	**www.wikbooks.org**
3	**Khaan Academy**

b). Journals & Handbooks:

1). Journal of mechanical engineering

2). Journal of mechanics of solid

3). Journal of SAE

c). Associations and Institutions:

1). ASME-American Society of Mechanical Engineers

2). Institution of Mechanical Engineers (India)

8). Syllabus Deployment: -

a). Total weeks available for academics (excluding exams/ holidays) as per PGC calendar-

Semester	I
No. of Working days available(Approx.)	66
No. of Weeks (Approx.)	11

- Total weeks available for covering RTU syllabus- 11 weeks (Approx.)
- Total weeks available for special activities (as mentioned below)- 01 week (Approx.)

Note: Individual faculty must calculate the exact no. of lectures available according to time table etc. after consultation with HOD.

b). Special Activities (approved by HOD, Dean, and Campus Director and mentioned in deployment):

- Quiz- A total of two hours in a semester to be conducted before and after first midterm

- Special Lectures (SPL)- 10% of total no. of lectures including following
    i. PPT Mode

- Revision, Problem Solving and discussion on Important Question Bank of one hour each (a total of two hours) before I & II Mid Term Exam.

c). Lecture schedule per week

i). University scheme (L+T+P) = 3+0+0

ii). PGC scheme (L+T+P) = 3+0+0

Sr. No.	Name of Unit	No. of lectures	Broad Area	Degree of difficulty (High/Medium /Low)	Text/ Reference books
1.	Fundamentals and Steam Boilers, Steam Turbines and	12	Fundamentals, Steam Boilers, Steam Turbines and Power Plants	Medium /Low	G. Shanmugam and S Ravindra
2.	Pumps and IC Engines	7	Pumps and IC Engines	High/Medium	P.N Gupta
3.	Refrigeration and Air Conditioning and Power	6	Refrigeration and Air Conditioning	Medium /Low	K Venu Gopal and Prabhu Raja
4.	Transmission of Power	6	Transmission of Power	Medium	A.K. Rajvanshi
5.	Primary Manufacturing	4	Primary Manufacturing Processes	High/Medium	K Venu Gopal and Prabhu Raja
6.	Engineering Materials and Heat	3	Engineering Materials and Heat Treatment of Steel	High/Medium	G. Shanmugam and S Ravindra

d). Introduction & Conclusion: Each subject, unit and topic shall start with introduction & close with conclusion. In case of the subject, it is Zero lecture.

e). Time Distribution in lecture class: - Time allotted: 60 min.

i. First 5 min. should be utilized for paying attention towards students who were absent for last lecture or continuously absent for many days + taking attendance by calling the names of the students and also sharing any new/relevant information.
ii. Actual lecture delivery should be of 50 min.
iii. Last 5 min. should be utilized by recapping/ conclusion of the topic. Providing brief introduction of the coming up lecture and suggesting portion to read.
iv. After completion of any Unit/Chapter a short quiz should be organized.
v. During lecture student should be encouraged to ask the question**.**

Note: Pl. ensures that each student is having Lecture Note Book. Pl. Write on the black board day and date, name of the teacher, name of sub. with code, unit and lecture no. and topics to be covered at the beginning of each lecture and ensure that students write in lecture note book. Ask students to leave 4/5 pages blank for copying the note from fellow students in case of their absenteeism.

9). Tutorial: - An essential component of Teaching- Learning process in Professional Education.

Objective: - To enhance the recall mechanism.

To promote logical reasoning and thinking of the students.

To interact personally to the students for improve numerical solving ability.

a). *Tutorial processing:* - Tutorial sheet shall be provided to each students

Ist Phase: - It is consisting of questions to be solved in the class assignment session in test mode on perforated sheet given in tutorial notebook and to be collected & kept by respective faculty for review & analysis (20 minutes).

IInd Phase: - Indicating/Initializing the weak issues/ drawback and Evaluating and providing the grade. Making a group with good student for assisting the weak students to explain/solve questions by every student on plain papers given in tutorial note book (20 minutes).

IIIrd Phase: - Solving/ explaining difficulties of lecture class and providing the new home assignment (20 minutes). To be done in tutorial note book.

b). *Home assignment shall comprise of two parts:*

Part (i) Minimum essential questions, which are to be solved and submitted by all within specified due date.

Part (ii) other important questions, which may also be solved and submitted for examining and guidance by teacher.

10). Examination Systems:

Sr. No.	**Name of the Exam**	**Max. Marks**	**% of passing marks**	**Nature of paper Theory + Numerical**	**Syllabus coverage (in %)**	**Conducted by**
1.	Ist Mid Term Exam	60	40%	Theory+ Numerical	60%	College
2.	IInd Mid Term Exam	60	40%	Theory+ Numerical	40%	College
3.	University (End) Term Exam	70	40%	Theory+ Numerical	100%	University

11). Any other important point: It is important to give more focus to the numerical problems and also How to solve those problems in university exams.

Mapping of CO-PO

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-

Place & Date:

PCE,

Name of Faculty with Designation

Dr. ANKIT TYAGI

(Associate Professor)

POORNIMA
COLLEGE OF ENGINEERING

UNIT - 1

DETAILED LECTURE NOTES

Engineering →

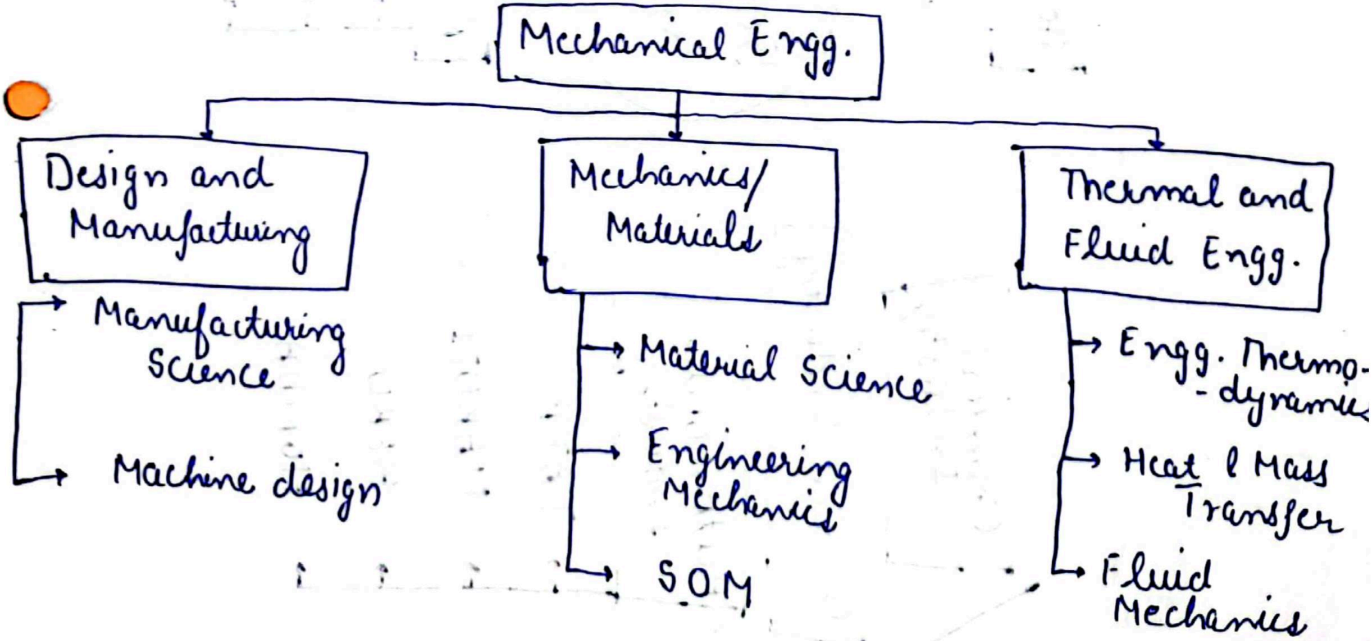
The term Engineering is drive from latin word "Ingenium" means cleverness.

→ It is application of knowledge in term of science, design, construction, maintance, production and operation of machines, system processes, materials devices and organizations.

Introduction to Mechanical Engineering →

→ It is a branch of engineering that involves design production and machinery with the usage of heat and mechanical power.

→ It deals with anything that are in motion. and



Scope of Mechanical Engg –

Typically Works on Following Things

- Analyze Problems
- Design / Redesign
- Develop & test Prototype
- Analyze the test result
- Product Manufacturing

Tools used in Mechanical Engg.

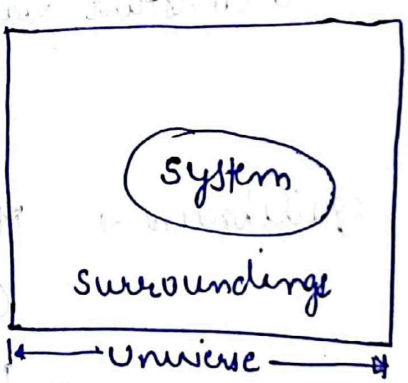
- CAE / CAD/CAM
- FEA
- Solid Modelling
- CFD

Concepts of Thermal Engineering →

→ Branch of science which deals with heat and temp^{r}.
→ It is an application of thermodynamics and other science, which deals designing, building and maintaining things that are ~~used~~ related to heating and cooling.

Application →

1. Steam power Plant
2. RAC
3. I C Engine
4. Compressor
5. Gas turbine



System → In thermodynamics the particular item or collections of items that we are interested, who is called System

Surrounding → Everything that's not included in the system we have defined is called the surroundings.

There are three types of system in Thermodynamics

① Open → Both energy & Matter
② Closed → Only energy
③ Isolated → Cannot exchange either matter or energy

Four Laws of thermodynamics →

① Zeroth law of thermodynamics → thermal equilibrium
② First law of thermodynamics → energy is constant (neither nor) $\Delta E = q + w$
③ Second law of thermodynamics $\Delta S = \frac{dQ}{T}$
↳ evaluate performance of system (availability of energy)
④ Third law of thermodynamics
→ It state that entropy of a system approaches a constant value as the temp^r approaches zero.

Equilibrium → Mechanical (Equality of Pressure)
Chemical (" " chemical potential
Thermal (" " Temp^r)
Thermodynamics (" " Mechanical, chemical & thermal)

Intensive → Independent of mass
(density, temp^r, viscosity)
Extensive → depends upon mass (energy, enthalpy, volume, entropy)

Mechanical Machine Design →

→ Branch of engineering design, that can lead to the formation of entirely new machine or it can lead to improvement of the existing machine.

→ defined as the process by which resources or energy is converted into useful mechanical forms.

Manufacturing Engineering →

→ It deals with manufacturing science and practices including the research, design and development of systems, processes, machine, tools and equipment.

→ Primary focus is to turn raw materials into a new or updated product in the most economical, efficient and effective way possible.

→ Manufacturing engineers develop and create physicals artifacts, production processes and technology.

→ Manufacturing engineers success or failure directly impacts the advancement of technology and spread innovation.

CamScanner

① Numerical control machine tools and automated systems of production.

② Advanced statistical method of quality control.

③ Industrial robots on the factory floor.

Industrial Engineering

→ Branches of engineering which deals with the optimization of complex processes, systems or organizations.

→ Industrial engineer work to eliminate waste of time, money, materials, person-hours, machine time energy and other resources that do not generate value.

→ It concerned with the development, improvement and implementation of integrated systems of people money, knowledge, information, energy, matter material.

Topics concerning industrial engineers →

① Process engineering

② Design, operation, control and optimization of chemical, physical and biological processes.

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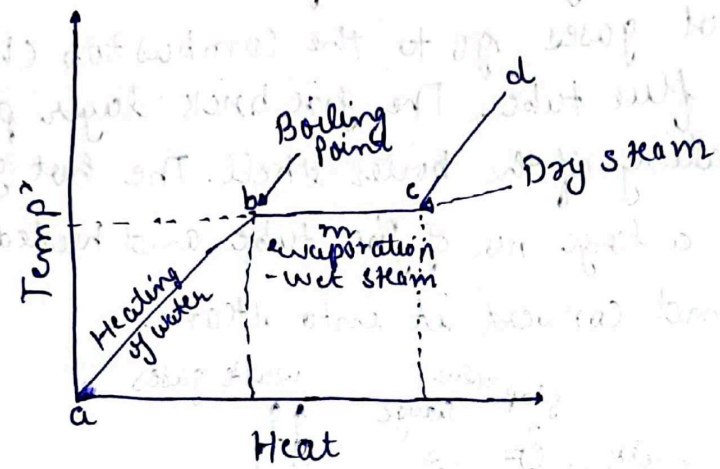
Steam Boilers and steam Turbines



Formation of steam

1. Boiling point of water
2. Evaporation of water
3. superheating

Boiler →

The function of a boiler is to evaporate water into steam at a pressure higher than the atmospheric pressure.

Types of Boiler →

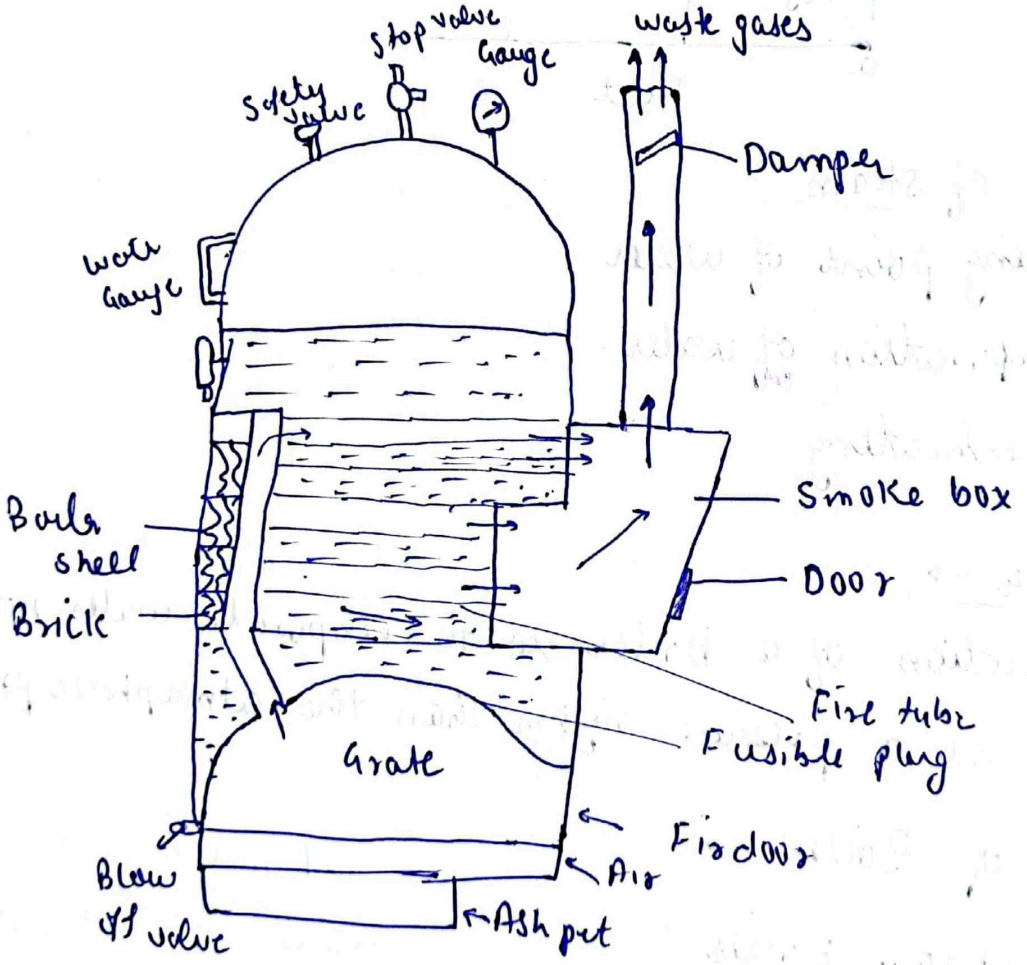
1. Cochran Boiler
2. Locomotive Boiler
3. Babcock & Wilcox Boiler
4. Lamont Boiler
5. Benson Boiler

Fire tube	Water tube
Cochran	Babcock & Wilcox
Locomotive	Benson

① Cochran Boiler

→ Vertical Fire tube Boiler

→ Fuel is fed into the grate through the fuel door and lighted. The fuel is burnt in the grate and hot gases go to the combustion chamber through a short flue tube. The fire brick layer prevents the over heating of the boiler shell. The hot gases pass through a large no. of fire tube and heated the surrounding water and convert it into steam.



→ It is a Vertical Multitubular, internally fired Natural Circulation Boiler.

Boiler Mountings →

① Water Gauge : indicate level of water inside the boiler

② Pressure Gauge : indicate pressure of steam.

③ Safety Valve : designed to open and some steam out when pressure exceeds the safe designed valve.

④ Main steam valve : Regulate or stop the flow of steam going out of the boiler to turbine, any engine or process work.

⑤ Blow off valve : Fitted at lowest level of water and helps to remove the salt deposits and other impurities in the bottom portion of the boiler.

⑥ Fusible Plug : Prevents overheating of the fire box and other parts of boiler.

Locomotive Boiler → (1.5m dia & 4m length) (about 157 fire of dia 47.5mm & 24 fire tubes of 130mm dia)

→ Horizontal fire tube boiler which is mostly used in railway.

→ Fuel is fed into the fire box through fuel door. Air enters through the damper and slots in the grate Plate. The rate of combustion and the amount of steam generated is controlled by damper. The fire brick arch deflect the hot gases and improves combustion efficiency.

CamScanner

→ The hot gases pass through large no. of fire tubes and enter into the smoke box. The circulation of air and hot gases is improved by means of induced draft produced in the smoke box. Waste steam from the engine enters the smoke box through the blast pipe and expands, Due to that, it produces a partial vacuum which improves the movement of hot gases and air.

Ba Bock and Wilcox Boiler :→

→ It is a water tube boiler which consist of steam water drum mounted on the fire brick work. Hot gases from the furnace pass through a zig zag path through the fire brick baffles before going to chimney through the damper. The damper controls the rate of burning and thereby steam generation. The damper is operated by a chain passing through the set of pulleys. Water from the steam-water drum comes down to the downtake header and then goes to the up take header through large no. of water tubes inclined at 14° for better circulation.

→ Compare to fire tube boiler, the pressure capacity, thermal efficiency of this boiler is higher.

Lamount Boiler →

→ high pressure water tube boilers working on the forced circulation. The circulation is maintained by a centrifugal pump driven by a steam turbine using steam from the boiler. Due to forced circulation, rate of heat transfer and evaporative capacity of the boiler are increased.

→ Suitable for powerplant and have high thermal efficiency.

→ Due to high pressure of steam, the temp^{r} of steam is increased. So the temp^{r} of the furnance should also be increased by pre-heating the air. In boiler, bent tube made of high steel are used. In furnace, wall pipes are used to increase the capacity of the boiler and also to cool the furnace wall.

→ The boiler is fitted with usual mounting, such as water gauge, pressure gauge, safety valve, blow off valve.

Benson Boiler →

→ It is very similar to Lamont boiler but there is no drum.

→ This boiler can withstand very high pressure even higher than critical pressure of steam.

→ Absence of the drum reduces the weight and cost.

Characteristics of Good Boiler →

① The boiler should be able to evaporate steam at designed capacity, pressure, temp^r.

② Total cost of the boiler with all mounting should be low.

③ High thermal efficiency with low operational cost.

④ have provision for inspection of all parts and cleaning and maintance.

⑤ have provision for automatic control of water level pressure and temp^r.

⑥ Transport and erection of boiler at site should be easy and at minimum cost.

⑦ The part should be able to withstand fluctuations in pressure and temp^r.

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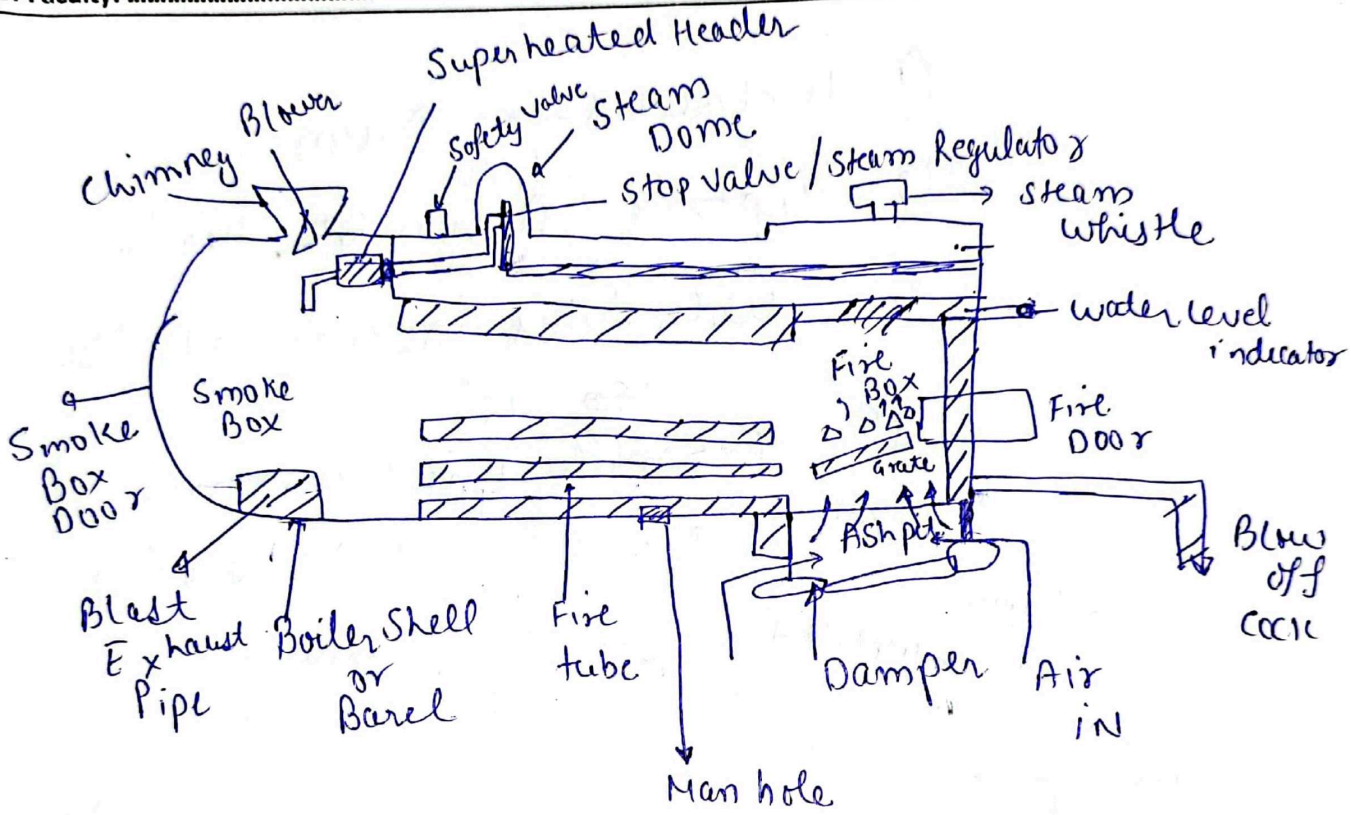
DETAILED LECTURE NOTES

Campus: ..... Course: ..... Class/Section: ..... Date: .....
Name of Faculty: ..... Name of Subject: ..... Code: .....



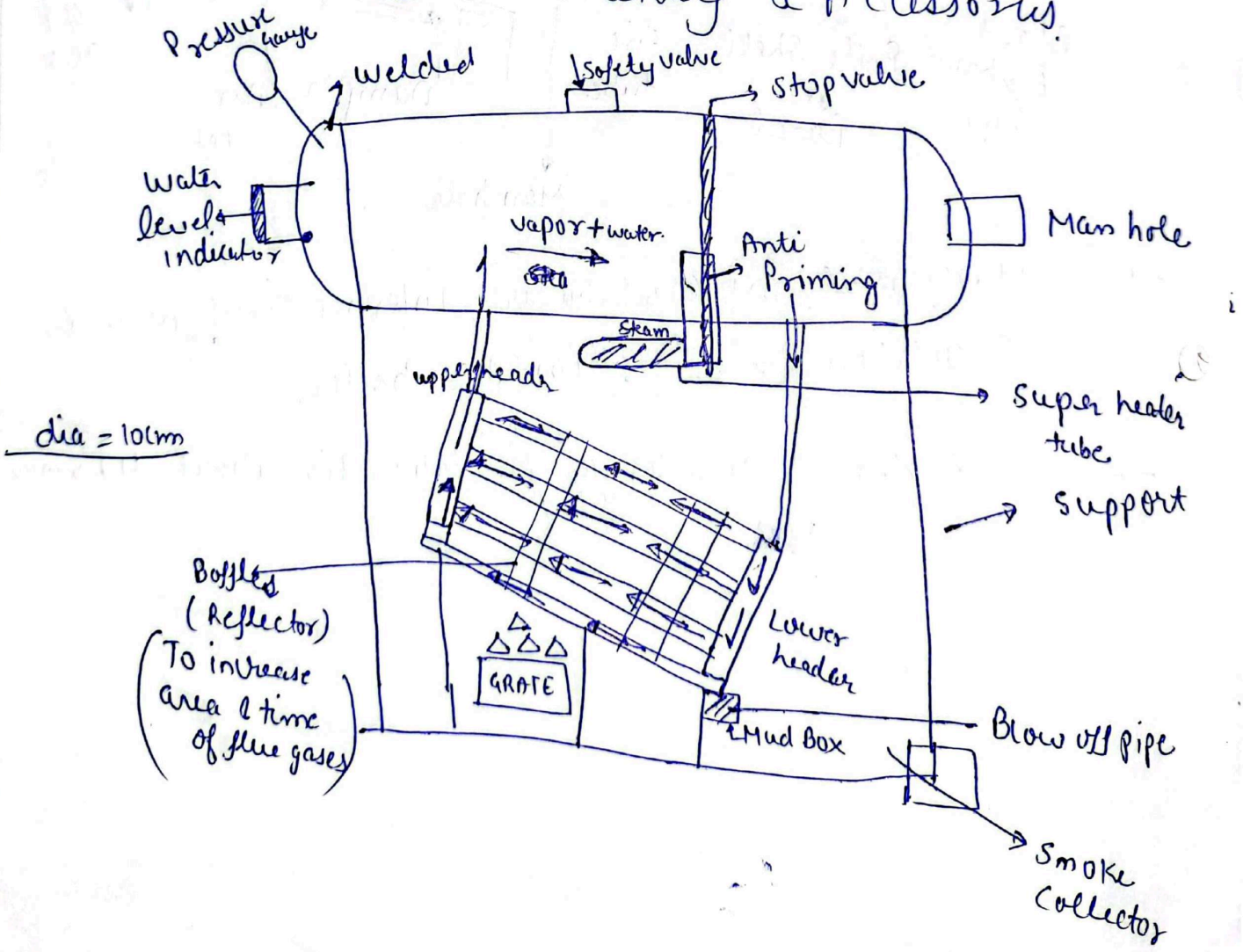
→ Horizontal, multitubular, internal Fired, natural Circulation Boiler. & Portable boiler.

→ 1.5 dia & 4m length / tube dia about 47.5mm

Babcock & Wilcox Boiler →

→ It is horizontal, externally Fired, water tube, natural circulation type of stationary Boiler.

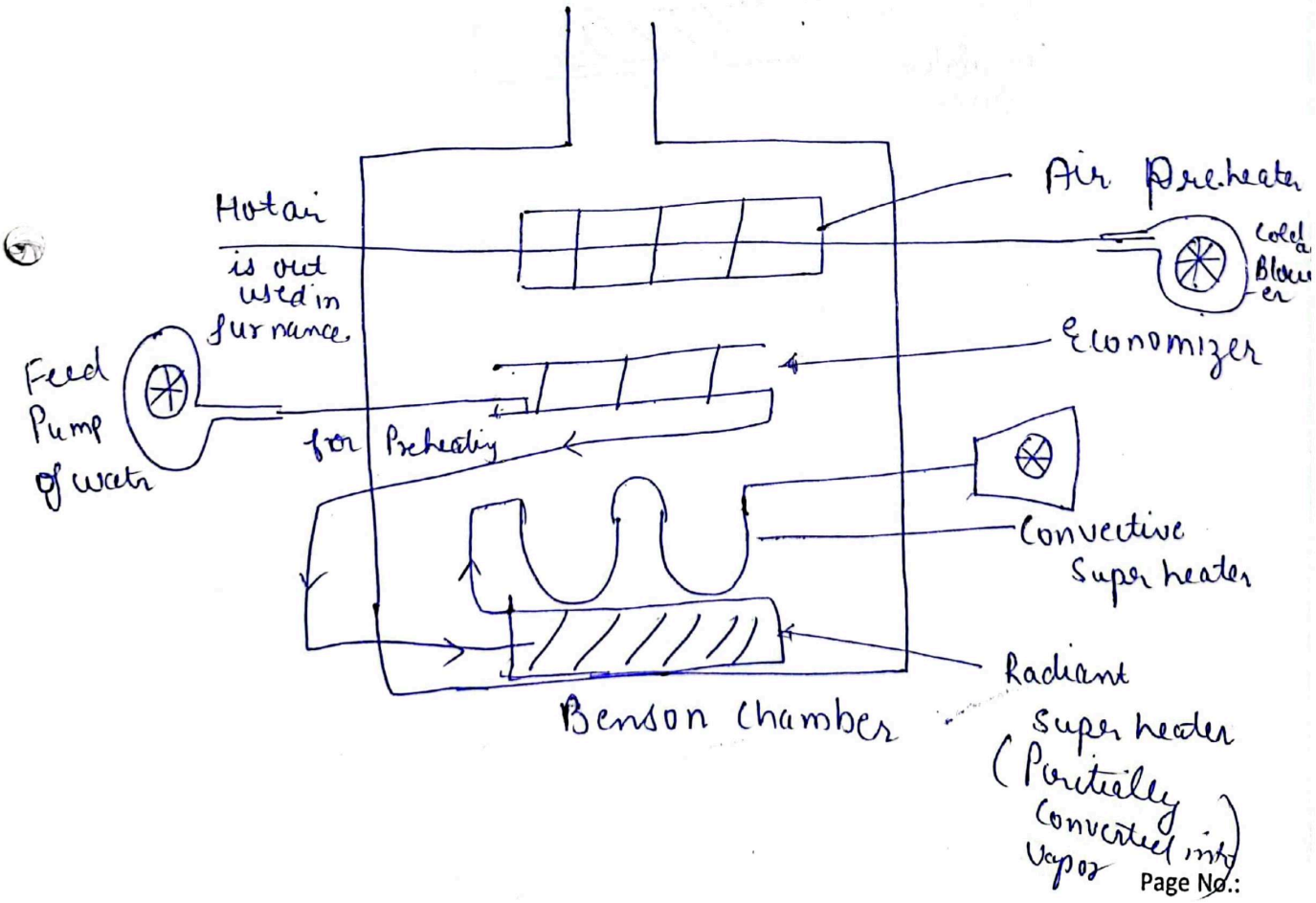
1. Welded Steel Drum
2. Uptake & Down take Header
3. Water tubes inclined at About ~~+50~~ 15°.
4. Externally Fired Furance
5. Mounting & Accessories



Benson Boiler →

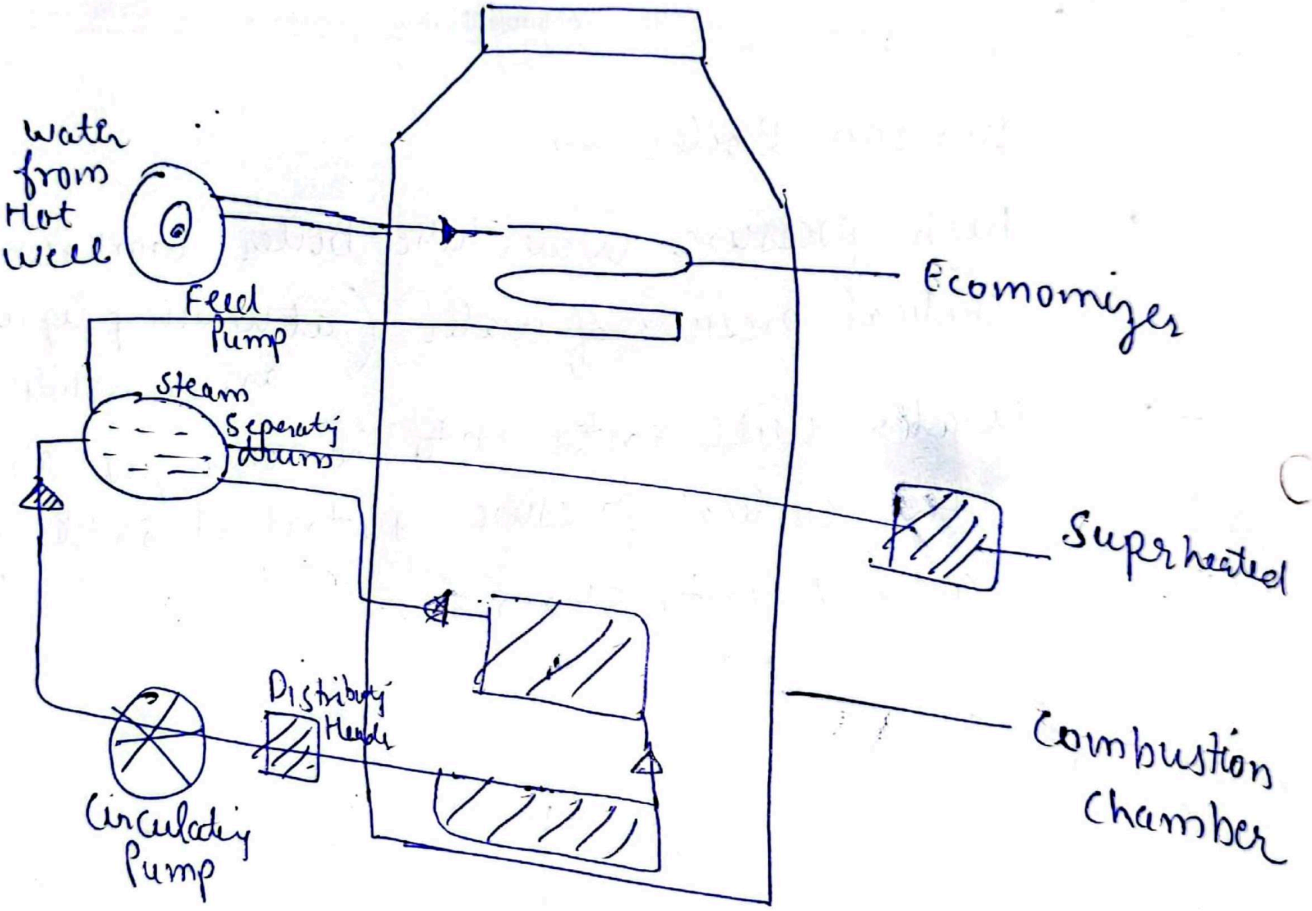
→ high pressure watertube boiler works on critical pressure of water (at which f liquid & gas are in equilibrium)

→ Water will enter into the boiler just above the critical pressure so that it suddenly convert into steam.



Lamount

Vertically Forced circulation, internally fired, water tube



Difference b/w Fire tube and water tube Boilers :-

Fire tube boiler	Water tube boiler
(1) Hot gases passes through the tube with water surrounding them.	(1) Water passes through the tube with hot gases surrounding them.
(2) Used for low pressure steam as dia of shell is large.	(2) Drum dia is less and used for medium and high pressure.
(3) Restricted to pressure upto to 10 bar.	(3) Restricted to 100 bar pressure
(4) Used for industrial application due to low pressure	(4) Used for power plant where high pressure is needed.
(5) Less no. of parts	(5) More no. of parts.
(6) More steam space so pressure fluction is less.	(6) less steam space, pressure fluctuation is more when steam is taken out.
(7) Thermal efficiency is low.	(7) High thermal efficiency.

Steam Turbine →

→ It is a primary mover in which rotary motion is obtained by the gradual change of momentum of the steam.

→ They are primarily used to run alternators or generators in thermal power plants.

→ Used to rotate propeller of ships through reduction gearing.

→ Due to complicated design and manufacturing of turbine blades, there are limited no. of manufacturers of steam turbines.

Main parts of Steam Turbines →

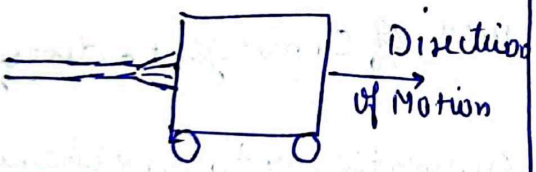
1. Nozzles
2. Rotor
3. Blades
4. Casing

Types of Turbines →

1. Impulse Turbines
2. Reaction Turbines

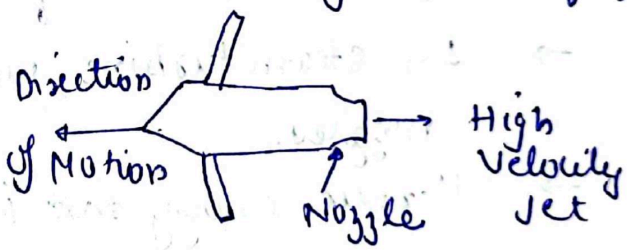
Impulse Turbines

① Force imparted on an object when jet of fluid strikes the object with great velocity.



Reaction Turbines

① Force imparted on the object when a fluid leaves the object with high relative velocity.
Ex → Swiming, recoil of agun



→ The jet move forward due to reaction of the high velocity jet of hot gases from the nozzle.

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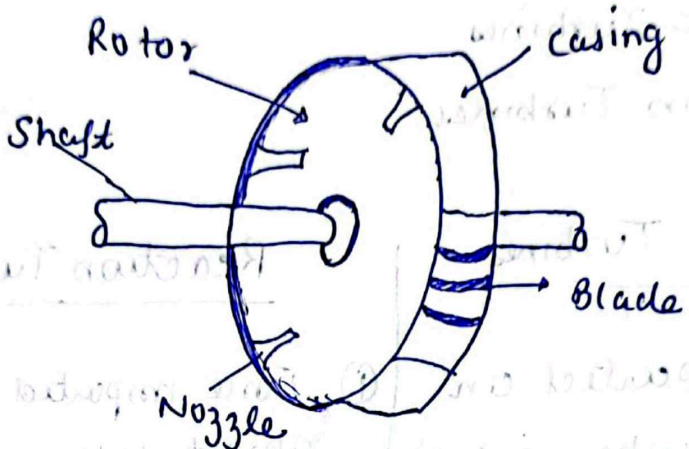
Working of a Single-Stage Impulse Turbine → De-Laval Turbine



→ Pressure energy is converted into kinetic energy by the expansion of steam through a set of Nozzle.

→ In steam turbine, we used of convergent-divergent nozzles.

→ Kinetic energy is converted into mechanical energy with the help of moving blades fixed on the rotor. The rotor is contected to output shaft

→ Suitable for low pressure steam. In case the steam pressure is high, when it expands in one set of nozzle, the outlet velocity of steam from the end of the nozzle will be too high.

→ Due to high velocity of steam, the rotor will rotate at a very high speed. Such high speed is not suitable for practical purposes.

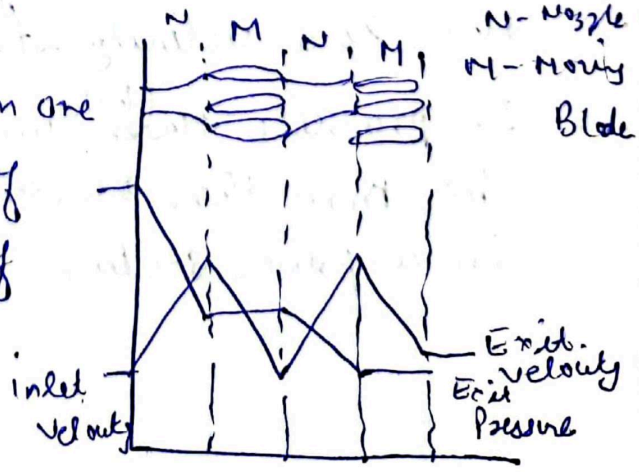
So in practice, we make use of multistage impulse turbines or compound impulse turbines

Compounding of Impulse steam Turbines →

1. Pressure compounding
2. Velocity compounding
3. Pressure velocity compounding

Pressure Compounding →

Pressure drop and expansion of steam is done in more than one set of nozzles and each set of nozzle is followed by a set of moving blades.



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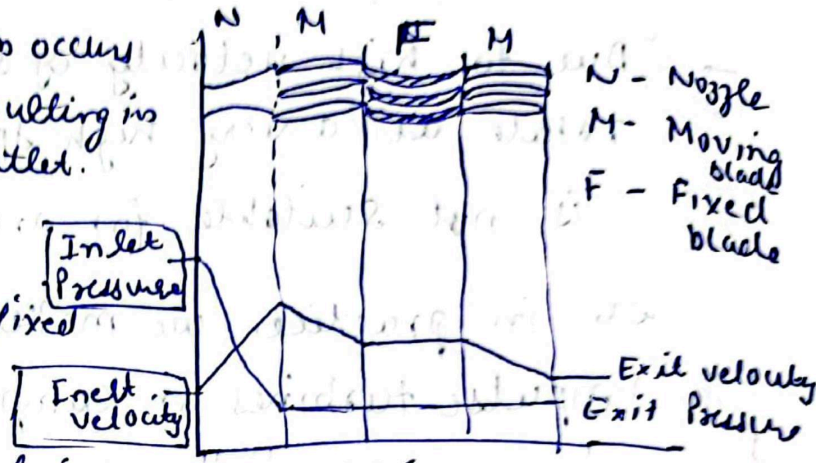
② Velocity Compounding →

→ Entire expansion of steam occurs in one set of nozzles resulting in very high velocity at outlet.

→ The steam is then passed through several sets of moving blades followed by fixed blades.



→ Moving Blade is fitted at the rotor while the fixed blades are fixed at the casing

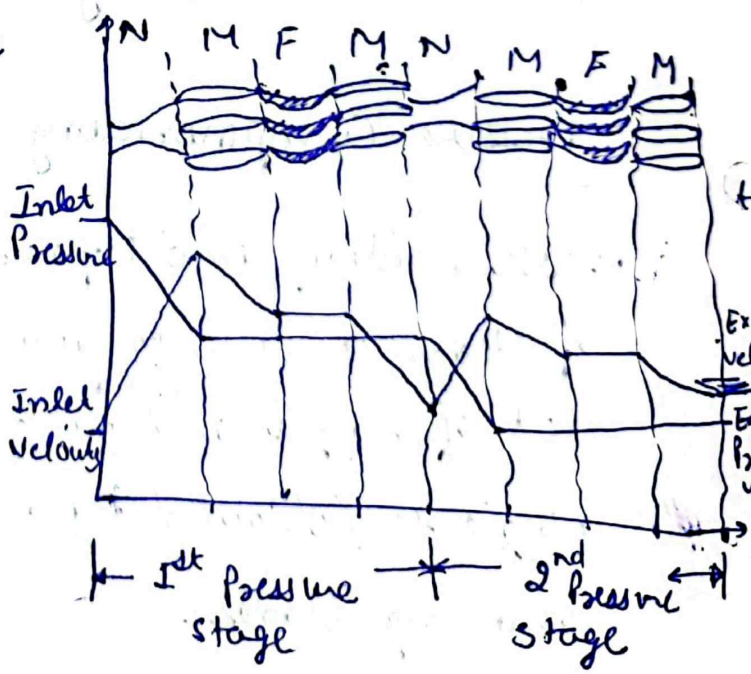
→ The function of fixed blade is to change direction of steam and guide the steam in a proper angle to next set of moving blades.

③ Pressure Velocity Compounding →

→ In power plants, pressure velocity compoundings is common.

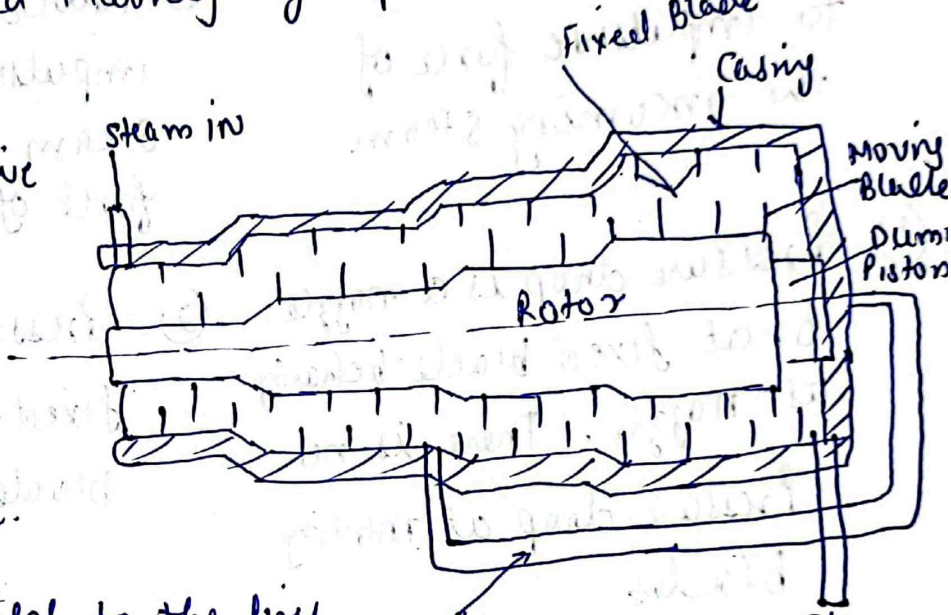
→ For each pressure stage there is a velocity staging.

→ In practice there will be more than 20 stages in a power station.



Working of Parson's Reaction Turbine →

→ Power is obtained Mainly by impulsive Force of the incoming steam and small reactive Force of the outgoing steam



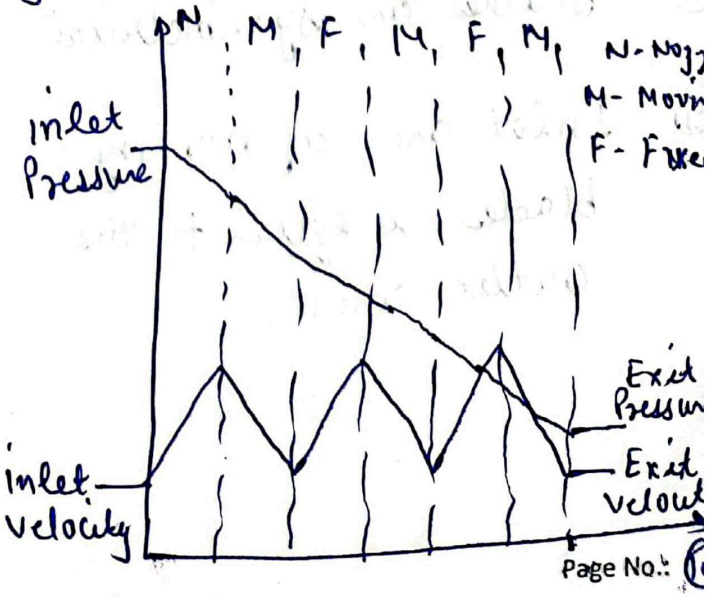
→ Consist of rotor of varing diameter.

→ Steam is admitted to the first set of moving blade through nozzles.

→ The blade receive the impulsive Force of the incoming steam Then it goes to fixed blades which acts as nozzles.

Thus Steam flows alternatively through moving & fixed blades

→ The shape of moving blades is so designed to also have the reactive force when the jet of steam is leaving the blade.



Difference b/w Impulse and Reaction Turbines

Impulse Turbines	Reaction Turbine
① Power is obtained due to impulsive force of the incoming steam.	① Power is obtained both the impulsive force of incoming steam and due to the reactive force of the outgoing steam.
② Pressure drop is a nozzle or at fixed blade behaving as nozzle. There is no Pressure drop at moving blades.	② Pressure drop is at fixed and also at moving blades.
③ Relative velocity at inlet and outlet of the moving blade are equal.	③ Relative velocity at outlet is higher to get reactive force.
④ Blades are symmetrical	④ Blades are not symmetrical.
⑤ Inlet area of moving blades is equal to the outlet area.	⑤ Outlet area of the moving blades is smaller than the inlet area.

Power Plants

→ Power plants are used for generation of electric power To improve the standard of living rapid industrialisation is necessary for which adequate electric power is essential.

Classification of Power Plants

1. Steam power plant
2. Nuclear power plant
3. Gas turbine power plant
4. Diesel power plant
5. Hydro electric power plant
6. Power from alternate source of energy.

Steam power Plant

→ Steam from the Boiler is taken to the turbine through the steam pipe fitted with an expansion joint.

→ From the turbine, steam enters into the condenser in which exhaust steam from the Good turbine is condensed due to which high vacuum is produced.

→ Due to vacuum, the power output and thermal efficiency of the turbine are considerably increased.

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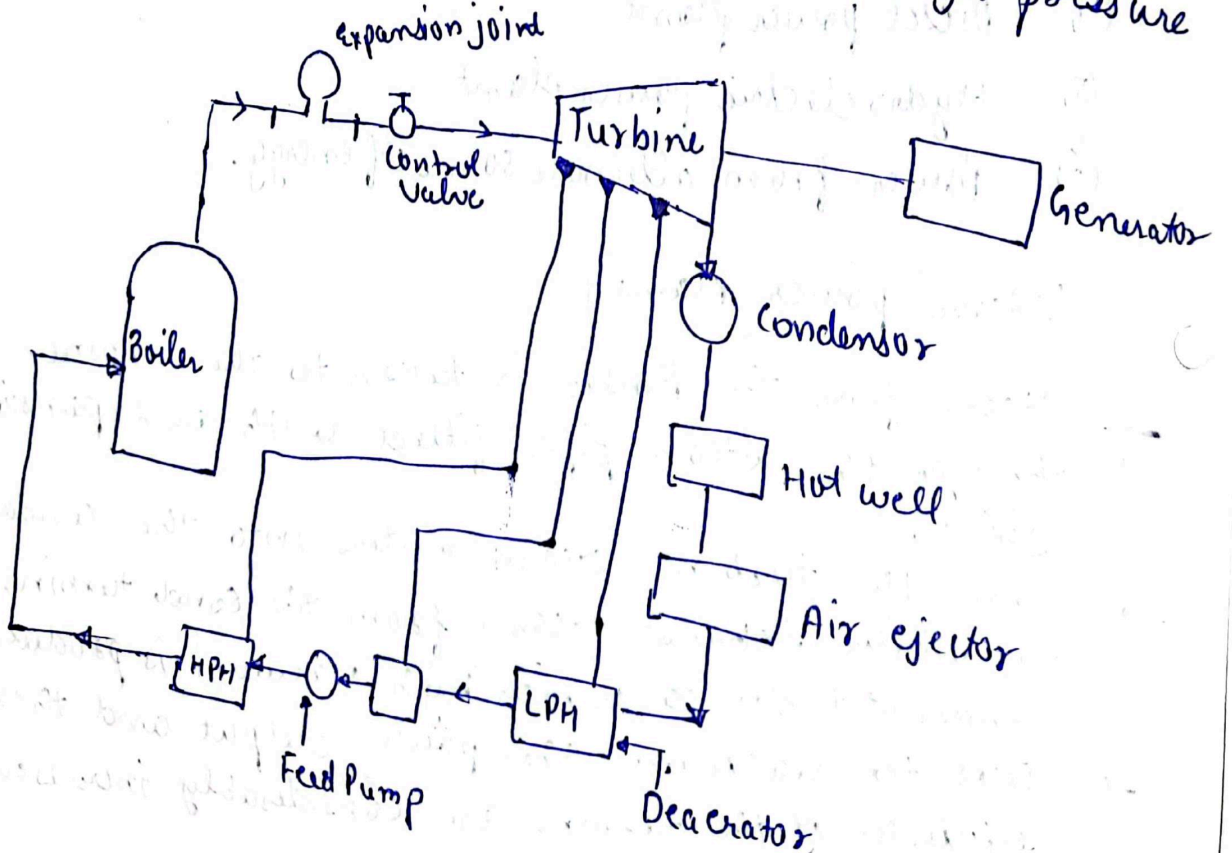
→ The condensed water can be recirculated in the system
→ The cooling water at the outlet becomes hot and it is taken to a cooling pond or a cooling tower. to cool & recirculate the same water if the power plant is not located on the bank of river or lake.

① Removal of air and oxygen →

② → It is removed at the air ejector & deaerator if it is not removed from the feed water, vacuum cannot be maintained in the condenser resulting in loss of power & thermal efficiency.

③ Preheating the feed water in different stages using low pressure heater, a deaerator and high pressure heater (HPH).



(2) G

Factors to be considered in selection of site for a steam power Plant →

(3)

(1) Location should be at minimum distance from Load centre to avoid transmission loss.
(2) Availability of water is a desirable factor.
(3) Water should be free from salt to reduce the cost of water treatment.
(4) Soil should be satisfactory for a strong foundation.
(5) Adequate transport facility is desirable.
(6) Space should be available to store coal & Ash.

Electrostatic Precipitator →

→ Extensively used to remove dust and flyash from chimney gases in a power plant using solid fu

→ The waste gas with dust and ash is passed b/w oppositely charged wires and it becomes ionized as the voltage applied b/w the wires is quite high in the range of 40,000 to 50,000 volts.

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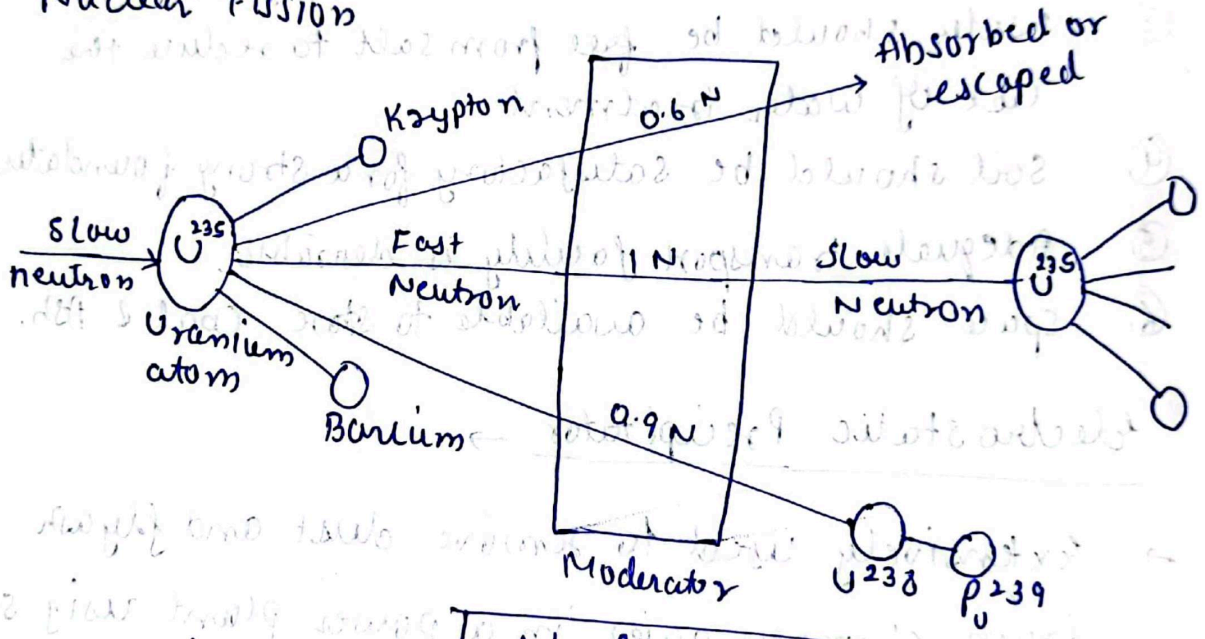
Nuclear Power Plant

→ It is very similar to a conventional steam power plant except for the furnace. It has been estimated that complete fusion of 1 Kg of Uranium U^{235} produces heat energy equivalent to 4500 tons of coal or 1700 tons of oil.

Dalton's Atomic Theory.

Nuclear Fusion

Nuclear Fission



Nuclear Reaction

Nuclear Reactor →

① Fuel

- Natural Uranium U^{235}
- Enriched Uranium
- Plutonium P_u^{239}
- Plutonium P_u^{233} (Man made)

(2) Control Rods →

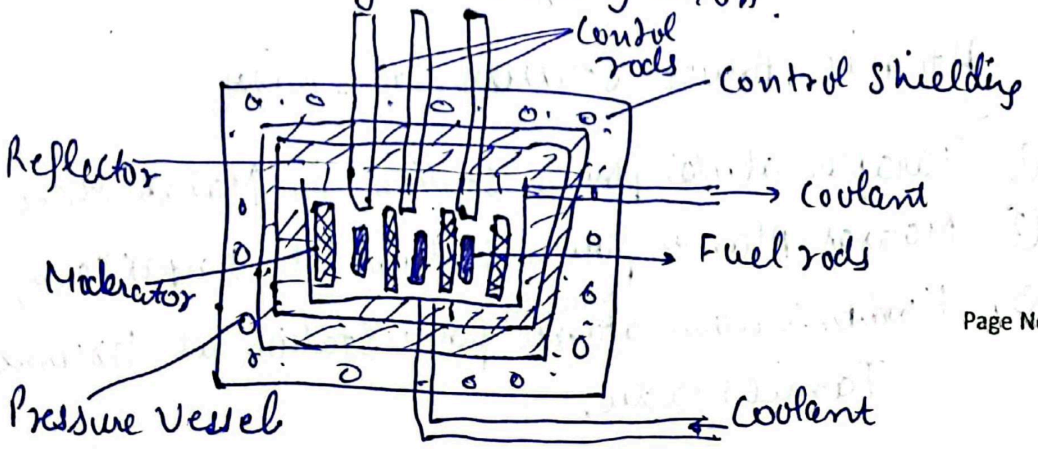
→ Absorb neutrons and control the rate of chain reaction Material like Boron, cadmium act as control rods.

(3) Moderator →

In chain reaction, neutrons produced are fast moving. They are less effective in causing fission of U^{235} so speed of neutrons should be reduce. This is done by making these neutrons collides with lighter nuclei of materials like graphite.

Reflector → Some neutrons trys to escape from the reactor and will be lost. So to, such losses are minimized by surrounding the reactor with a material called reflector. Beryllium is acts as reflector

Shielding → To shield the reactor with thick layer of concrete in order to prevent prevent human from Alpha, Beta & Gamma rays particles produced during nuclear fission.



① Pressurized Water Reactor
② Gas cooled Reactor
③ Safety Precautions for Nuclear Power Plant
④ Nuclear waste Disposal.

Advantages

① Very large amount of heat is liberated by a very small quantity of fuel.
② Suitable for large power generation
③ Cost of fuel transportation & storage is less.

Disadvantages

① Installation cost is very high
② Availability of nuclear fuel is scare and cost is high.
③ Maintance cost is higher
④ Skilled labour is required
⑤ Problem is waste disposal and there is also risk of radiation hazards.

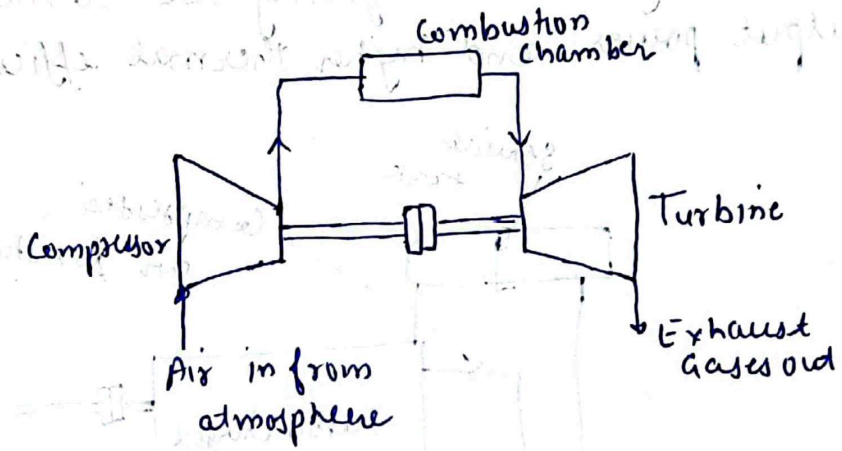
Atomic Power station in INDIA. →

① Tarapur atomic power station in Maharashtra
② Madras Atomic power station at Kalpakkam, Chennai
③ Koodenkulam Nuclear atomic power station at Tirunelveli district Tamil Nadu.

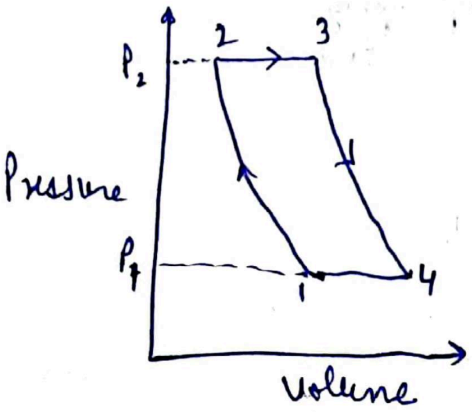
Gas Turbines

It is mainly for electri power generation and also in jet engines of air craft and in turbo chargers of I C engines.

Working of an Open cycle Single stage Gas Turbine →



Air from the atmosphere is taken and compressed to a pressure ratio ranging from 2-8 before passing to the combustion chamber where fuel is sg injected.
The fuel burn and temp^r is raised at constant pressure.
It then passes to the turbine where it expands to its Orginal pressure before being exhausted to the atmosphere

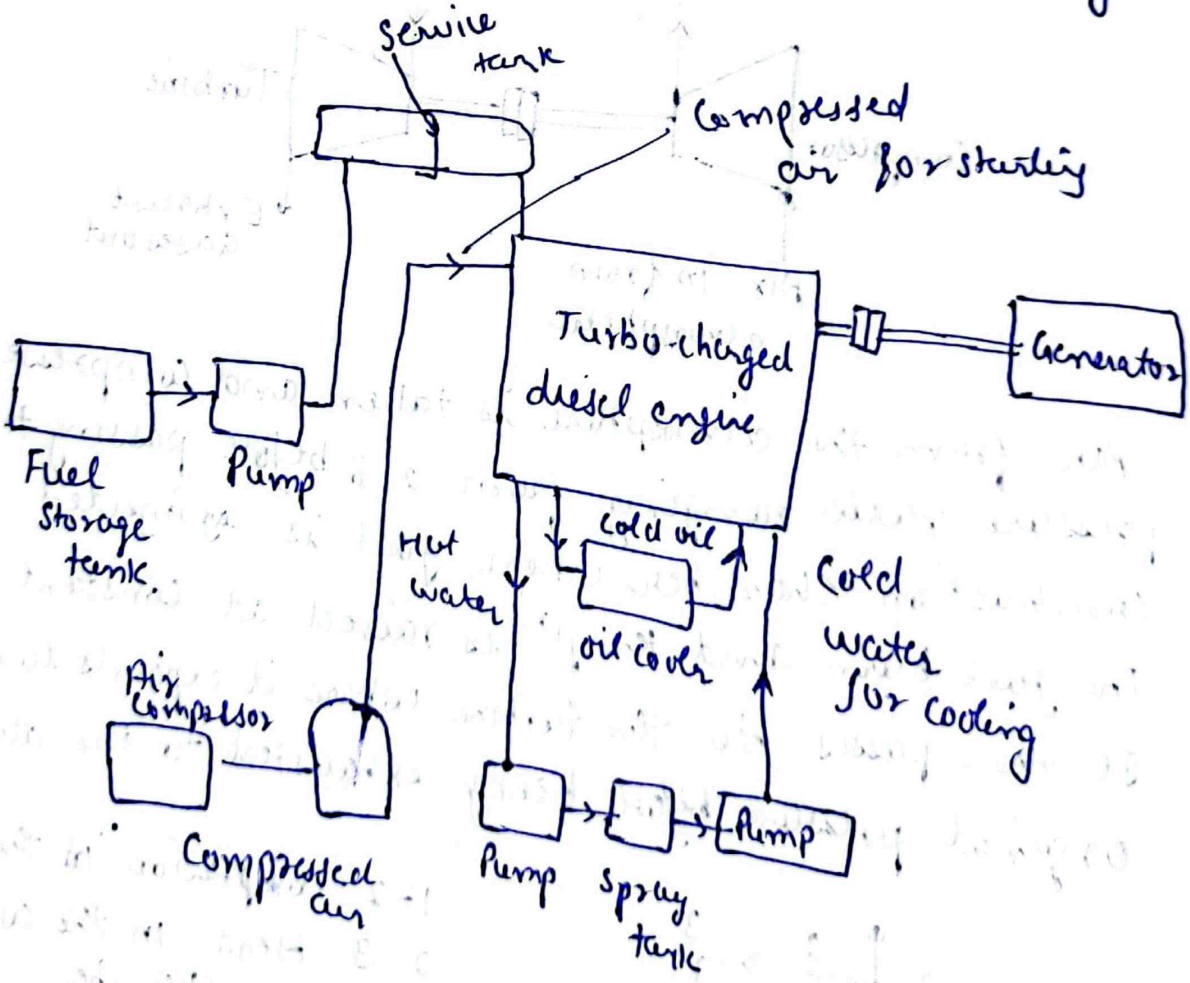


1-2 Compression in the Compressor
2-3 Heat in the combustion chamber
3-4 Expension in turbine

Diesel Power Plant →

→ Mainly multicylinder 2-stroke turbocharged diesel engines are used in power plants.

→ In turbocharged engine, the atmospheric air is compressed by a compressor run by an exhaust driven gas turbine and compressed air is taken inside the cylinder. Due to this, mass of air intake and amount of fuel burnt will be considerably increased giving rise to increased output power and higher thermal efficiency.

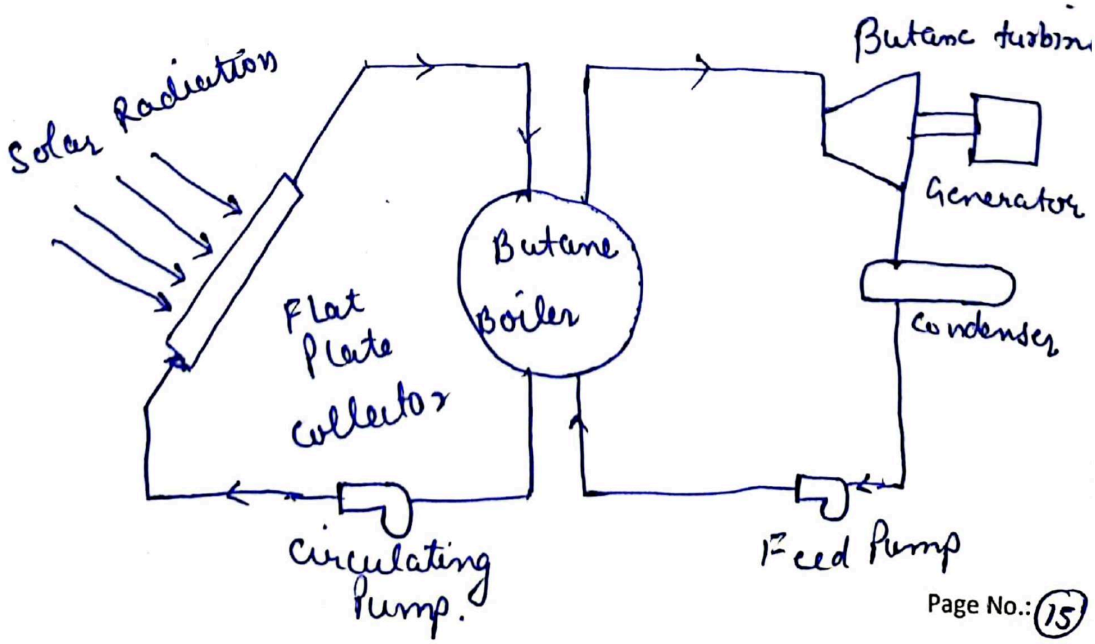


Solar Energy

- Solar Heater
- Solar Flat Plate Collector
- Parabolic Reflector

Solar Power Plant using Butane Boiler

→ Water in the flat Plate collector is heated to 70 - 80°C due to Solar radiation. The hot water heats the butane liquids in butane boiler. As butane vaporizes at 50°C, water at 70 to 80°C is able to vaporize butane. Hot water after transfering



Advantages of Solar Power Plant →

1. Heat energy from the sun is freely available so there is no pollution problem.
2. No transport and storage problem of any fuel.
3. Easy to construct and erect.

Disadvantages →

1. Solar energy is not available during night.
2. Power produced is rather small.

POORNIMA COLLEGE OF ENGINEERING

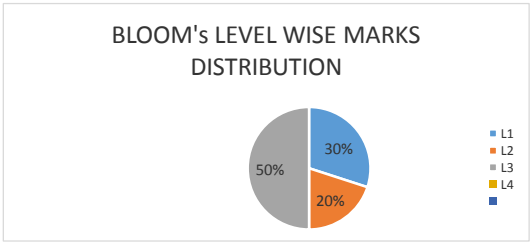
SESSION 2023-24

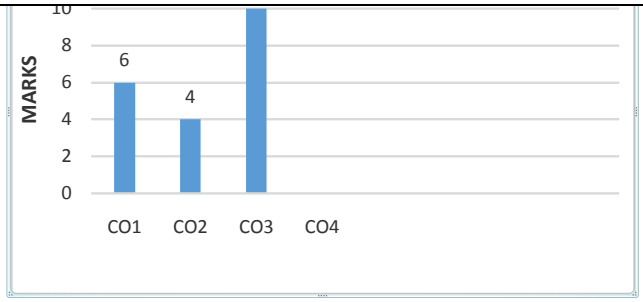
Assignment Sheet-1

Campus: PCE Course: B.Tech. Class/Section: ……. Date: …….
Name of Faculty: ……. Name of Subject: BME Code: 1FY3/2FY3-07
Date of Preparation:…….. Scheduled Date of Submission: …….

		Marks	CO	BL	PO
Q.1	Write down the difference between fire tube and water tube boiler.	2	CO3	L3	PO1
Q.2	Elaborate laws of thermodynamics and gas laws of thermodynamics.	2	CO1	L1	PO1
Q.3	What is the meant by pressure compounding and velocity compounding?	2	CO2	L2	PO1
Q.4	Explain different types of boiler mountings.	2	CO2	L2	PO1
Q.5	With the help of neat diagram explain the layout of steam power plant.	2	CO3	L3	PO1
Q.6	What is thermodynamic system? Differentiate various types of system in thermodynamics.	2	CO3	L3	PO1
Q.7	Explain the importance of CAD/CAM with some industrial examples.	2	CO3	L3	PO1
Q.8	What are the main parts of steam turbine? What is the function of steam nozzle?	2	CO3	L3	PO1
Q.9	Define mechanical engineering and its scope?	2	CO1	L1	PO1

Q. 10	Explain the working of steam power plant with the suitable diagram.	**2**	**CO1**	**L1**	**PO1**





BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analyzing, 5 – Evaluating, 6 - Creating)

CO – Course Outcomes; PO – Program Outcomes

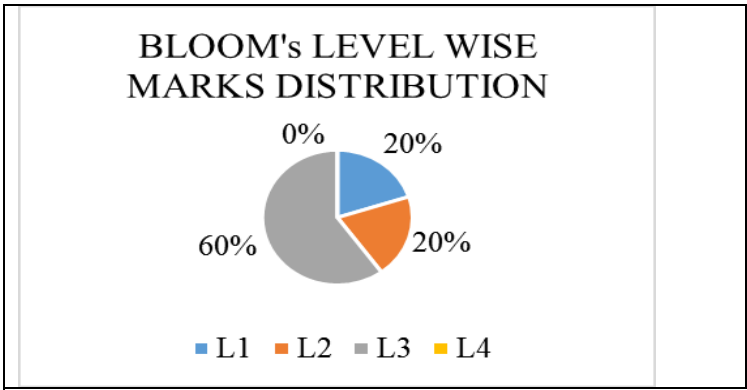
POORNIMA COLLEGE OF ENGINEERING

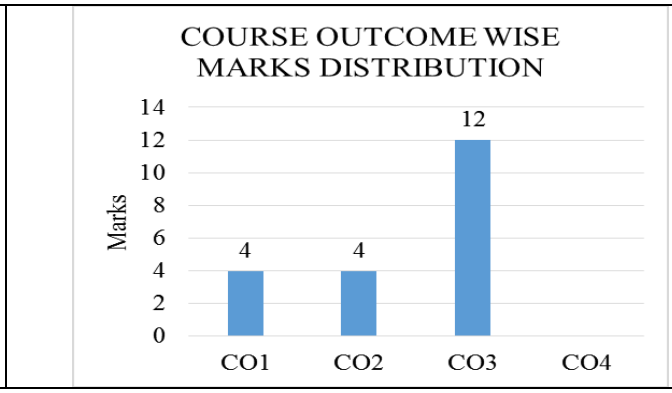
SESSION 2023-24

Assignment Sheet-1

Campus: PCE Course: B.Tech. Class/Section: ……. Date: …….
Name of Faculty: ……. Name of Subject: BME Code: 1FY3/2FY3-07
Date of Preparation:…….. Scheduled Date of Submission: …….

	Part A	Marks	CO	BL	PO
Q.1	Elaborate laws of thermodynamics and gas laws of thermodynamics.	1	CO1	L1	PO1
Q.2	Define Fire tube boiler?	1	CO1	L1	PO1
Q.3	What is thermodynamics?	1	CO1	L1	PO1
Q.4	Define Industrial Engineering?	1	CO1	L1	PO1
Q.5	What are the scope of mechanical Engineering?	2	CO3	L3	PO1
	Part B				
Q.6	Write down the difference between fire tube and water tube boiler.	2	CO2	L2	PO1
Q.7	Write down the difference pressure compounding and velocity compounding?	2	CO2	L2	PO1
Q.8	Explain different types of boiler mountings.	2	CO3	L3	PO1
Q.9	Explain the importance of CAD/CAM with some industrial examples.	2	CO3	L3	PO1
	Part C				
Q.10	With the help of neat diagram explain the layout of steam power plant or diesel power plant.	3	CO3	L3	PO1
Q.11	What are the main parts of steam turbine? What is the function of steam nozzle?	3	CO3	L3	PO1





BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analyzing, 5 – Evaluating, 6 - Creating)

CO – Course Outcomes; PO – Program Outcomes

Assignment - 1

Q.1 Define thermodynamics. Explain open system, closed system and isolated system.

Ans Thermodynamics is the branch of science that deals the transfer of energy and its effect on physical properties of substance. It is the relationship between heat, energy and work.

Classification of system :-

(i) Closed system :- A system in which mass is fixed and energy may be transfered from system to surrounding is known as closed system.

Ex :- A cup of coffee with a lid on it, piston cylinder without valve.

(ii) Open system :- A system that allows both mass and energy transfers across the boundaries it called open system.

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Ex:- A cup of coffee without lid, Air Compressor

(iii) Isolated system :- There is no interaction between system and surrounding is known as isolated system.

Ex :- Thermoflask

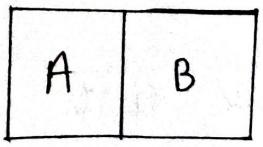
If neither mass nor energy cross the boundary of a system it is called an isolated system.

Q:- Explain the laws of thermodynamics and gas laws of thermodynamics.

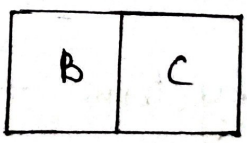
Ans Laws of thermodynamics :-

(i) Zeroth law of thermodynamics :-

→ If system 'A' is in thermal equilibrium with system 'B' and system 'B' is also in thermal equilibrium with system 'C' Then acc. to zeroth law of thermodynamics system 'A' and system 'C' be in thermal equilibrium.



if $T_A = T_B$



& $T_B = T_C$

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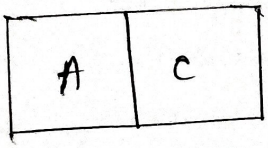
then concept of thermodynamics zeroth laws says



Hence $T_A = T_C$

Zeroth law is the basis of temp. measurement.

(ii) first law of thermodynamics :-

→ When a system operating in a cycle the net heat supplied to the system from the surroundings is equal to the net workdone on the surroundings.

$$\oint d\theta = \oint dw$$

$$\Delta V = Q - W$$

where ΔV = change in internal energy

Q = Heat added to the system

W = Work done by the system.

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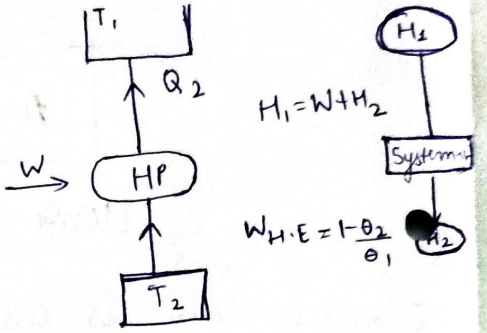
* (iii) Second law of thermodynamics

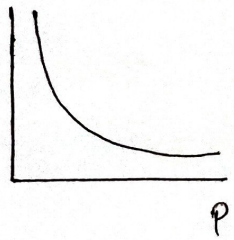
→ It is impossible to construct a device operating in a cycle where heat transfer is from cooler body to hotter body without any external work.

No system is 100 % efficient



Gas law of thermodynamics :-

(1) Boyle's law ($V \propto \frac{1}{P}$) ⇒ If the temperature of a gas remains constant, the volume of a gas is inversely proportional to the pressure.



$$V \propto \left(\frac{1}{P}\right)_{\text{constant}}$$

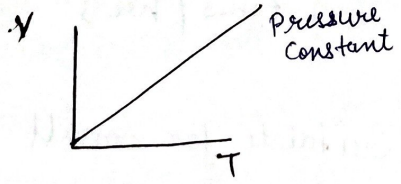
or $V = \frac{C}{P} \Rightarrow PV = C$

or $P_1V_1 = P_2V_2$

② Joule's law : Internal energy is a function of temperature only. It means the internal energy of an ideal gas doesn't change if volume and pressure changes (but does not changes if temperature changes).

③ Charle's law :- ($V \propto T$ at constant P)

Charles law is state that when any gas is heated at constant pressure the volume of a gas is directly proportional to absolute temp.



$V \propto T$ at P constant

$V = KT$

$\frac{V}{T} = K$

$= \frac{V_1}{V_2} = \frac{T_1}{T_2}$

④ Gay - Lussac's law :- ($P \propto T$) at (V = constant)

The pressure exerted by a gas is proportional to the temp. of the gas when volume is constant.

$P \propto T$ at V constant

$\left(\frac{P}{T}\right) = K$

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Thus, an ideal gas always obeys the perfect gas equation as follows

$$PV = nRT$$

Q.3 What are differences b/w fire tube and metal tube boilers.

ans

Water Tube	Fire Tube
1. Water is inside the tube and fire gases surrounding to it.	The gases inside the tube and water surrounded to it
2. Operating pressure is up to 165 bar (high pressure boilers).	operating pressure is up to 25 bar (low and medium pressure boilers).
3. Steam generation rate is very high (more than 450 tones/hr)	Less steam generation rate (9 tones/hr)
4. Suitable for power plant.	Suitable for small industry.
5. Chance of explosion is more due to high steam pressure.	Chance of explosion is less due to low steam pressure.
6. Provide steam in power plants to develop electrical energy.	Provide steam in chemical and pharamceutical industries.
7. Small chance of scale formation due to the flue gases are in shell.	More chance of scale formation.
8. Operating cost is high less floor area is required.	Operating cost is low more floor area is required.

Ex:- babcock and wilcon boiler	Ex:- vertical locomotive.

Q.4 what are the diff. between impulse & Reaction impulse turbines?

ans

Impulse	Reaction Impulse
1. It consists of nozzles and moving blades	It consists of blades which acts as nozzles and moving blades.
2. Steam is expanded Completely in the nozzle. all the potential energy is converted into K.E.	Steam is partially expanded in the fixed blades. Some amount of PE is converted into K.E.
3. Potential of steam is Constant over the moving blades.	Potential drops takes place in moving blades.
4. Because of high potential drop in the nozzles blade speed and steam speed are high.	Because small potential drop, blade speed & steam speed are less.
5. Low efficiency	High efficiency
6. Occupies less spaces per unit power.	occupies more space per unit power.

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Q.5. What are steam boiler ? State some application of steam boilers.

ans A steam boiler or generator is defined as a closed vessel in which water is converted into steam by burning fuel in presence of air at desired temperature, pressure and at desired mass flow rate.

Applications :-

1. used in steam turbines to develop electrical energy
2. Used to run steam engines.
3. In textile industries, sugar mills or in chemical industries is a co-generation plant.
4. Heating the buildings rooms in cold weather.
5. Producing hot water for hot water supply.

Q.6 Give three examples each of boiler mountings and boiler accessories.

ans Mountings :-

1. Safety valves
2. Water level indicator
3. Pressure gauge

Accessories :-

1. Feed pumps
2. Injector
3. Economiser

Q.7 What are the main parts of a steam turbine? What is the function of a steam nozzle.

Ans Steam turbine is one of the most important prime mover for generating electricity. This faces under the category of power producing turbomachine.

Main parts :-

1. Nozzles
2. Rotor
3. Blades
4. Casing

Function of steam nozzles :-

- In steam turbines, normally convergent and divergent types of nozzles are used. when the steam flows through the nozzles there is a pressure drop which is converted into the velocity or kinetic energy. It also guides the steam in proper direction strike the blades.
- It is placed very close to the blades to minimize the loses.

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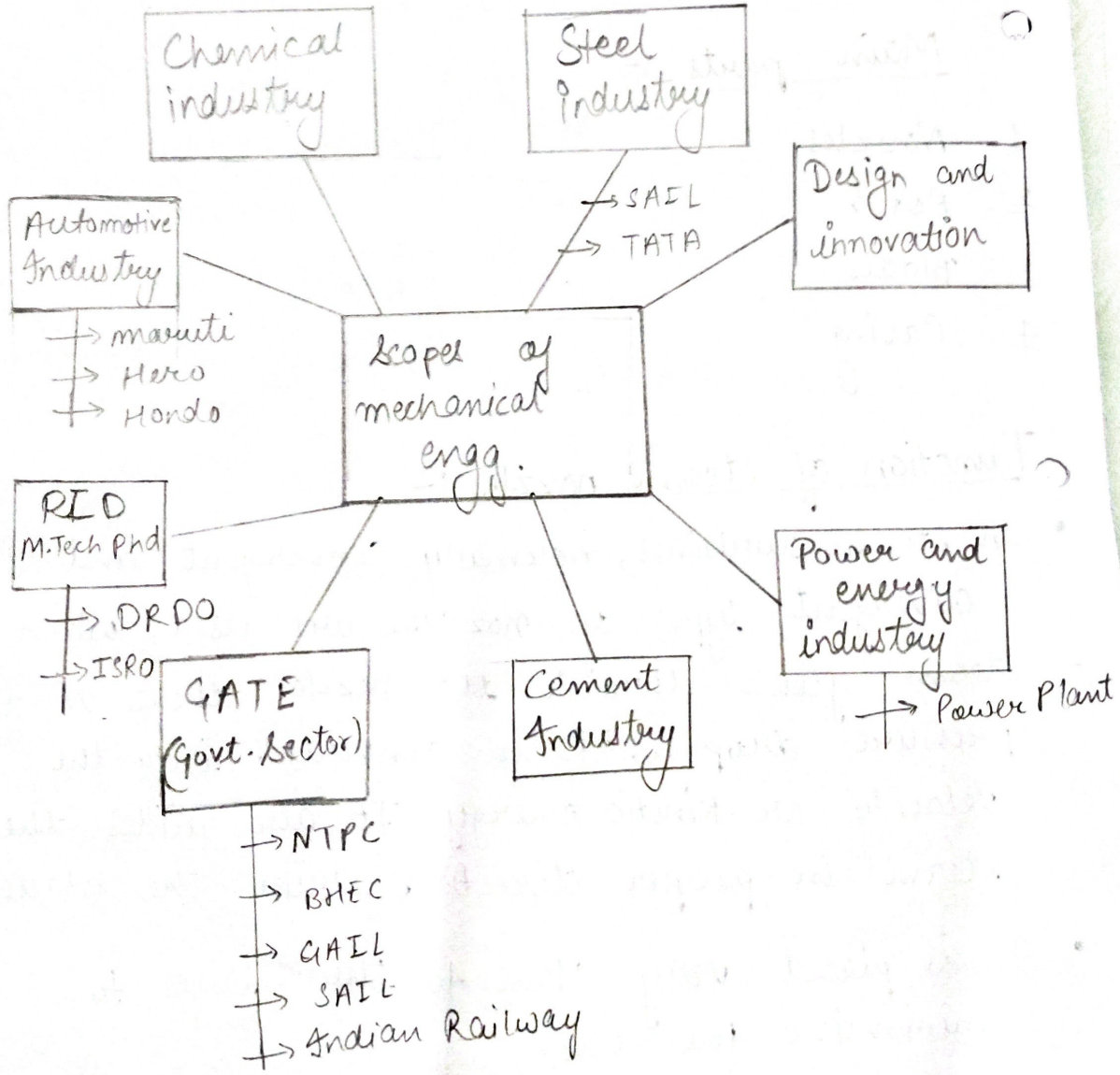
Q. 8 Define mechanical engineering and its scope.

ans Mechanical engg. is the discipline that applies the concept of engineering physics, engg. mathematics and material science, principles to design analysis, manufacture and maintain mechanical system.

Q.9



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Q.9 Explain the working of steam Power Plant with suitable diagram.

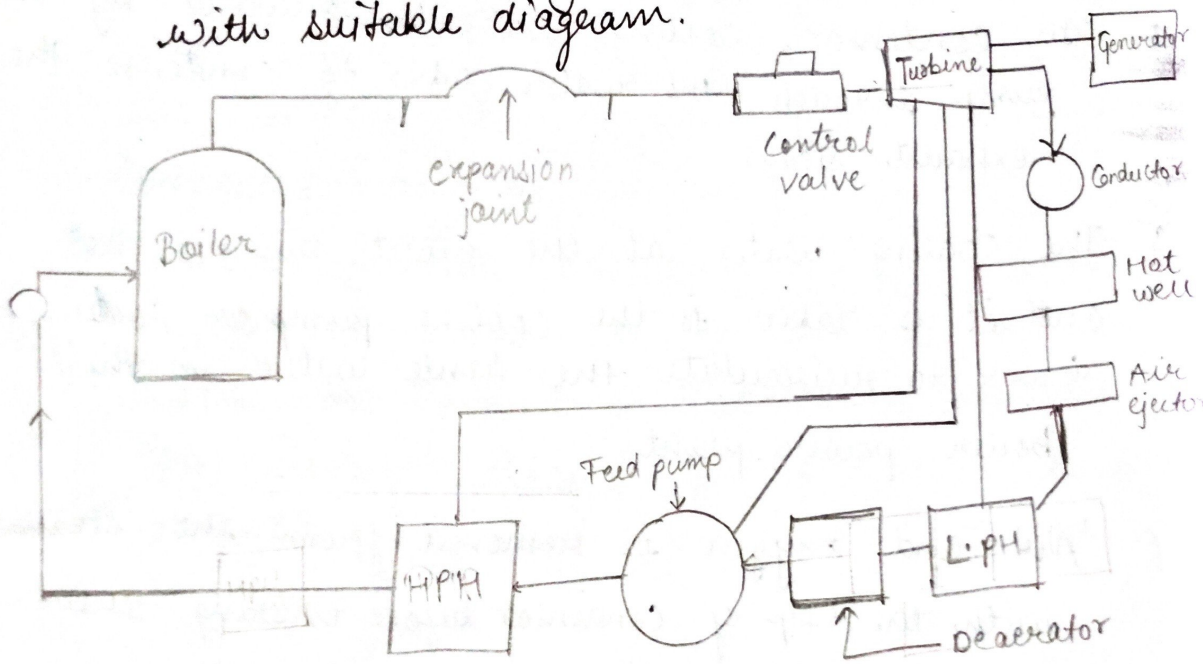


Fig :- Steam Power Plant.

Working of steam Power Plant :-

1. Steam from the boiler is taken to the turbine through which the steam pipe fitted with expansion joint.

2. From the turbine, steam enters a condensor. In the condensor, the exhaust steam from the turbine is condensed ~~into~~ due to which high vacuum

is produced. Due to high vaccum, the power out and thermal efficiency of the turbine is increased.

3. Also the condensed water is also recirculated in the system.

4. In condensor, cooling water is circulated by the pump through the water tubes to condense the exhaust steam.

5. The cooling water at the outlet becomes hot and it is taken to the cooling pump or cooling tower to recirculate the same water in the boiler power plant.

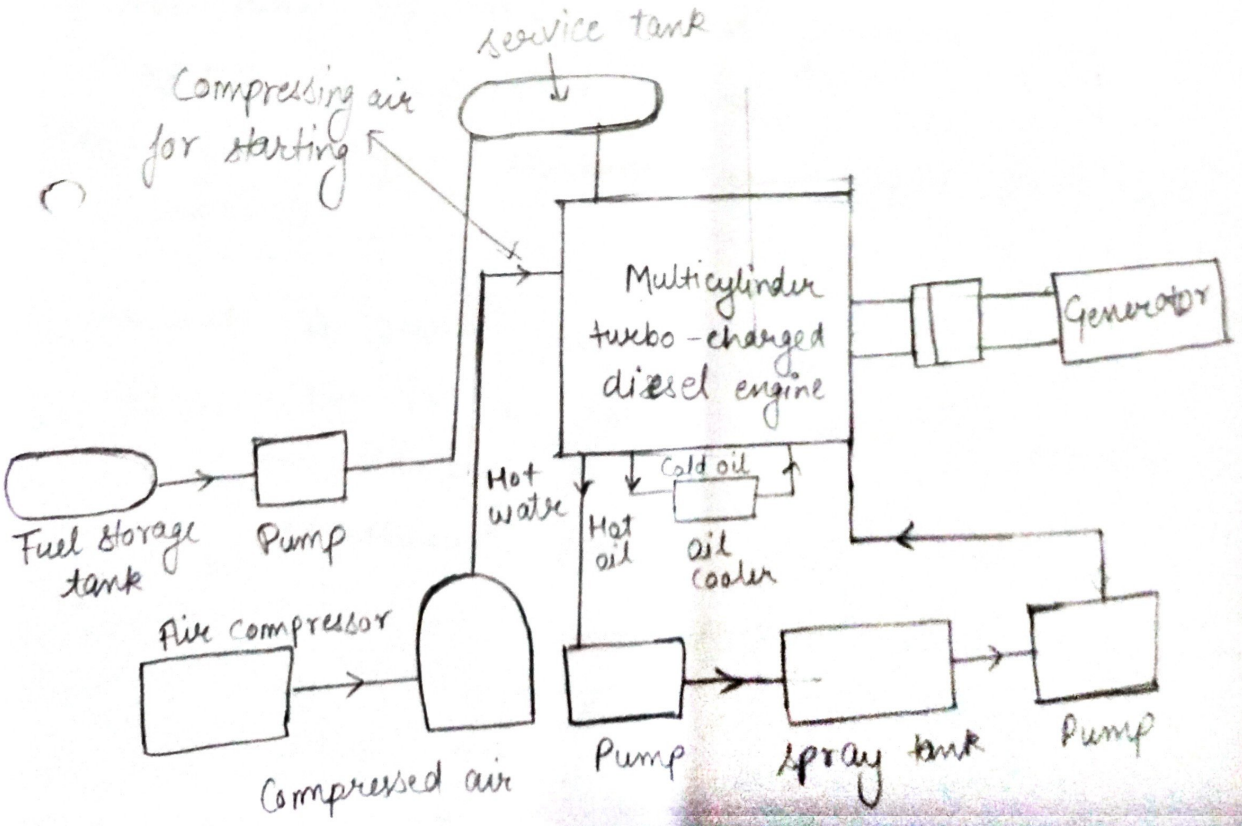
6. Air and oxygen is removed from the steam with the help of condensor before entering the boiler.

7. Pre heating the feed water at different stages using law pressure heater and high pressure water.

Q-10 Explain the working of Diesel Power Plant with suitable diagram.

ans The layout of a diesel power plant is given in fig. 1. Normally, multicylinder 2-stroke ~~atmospheric air~~ is compressed ~~by a compressor~~

turbocharged diesel engines are used in power plants. In a turbocharged engine, the atmospheric air is compressed by a compressor run by an exhaust-driven gas turbine and the compressed air is taken inside the cylinder. Due to this mass of air intake and amount of fuel burnt will be considerably increased giving rise to increased output power and higher thermal efficiency.



Layout of diesel Power Plant

Due to turbo charging the operating temperature of the engine is increased. So, the lubricating oil coming out of the engine should be cooled in an oil cooler. The cooling water from the engines is normally cooled in a spray tank and recirculated. Due to high capacity, the engine is started by using compressed air.

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Assignment No. 1

Q1: Describe the classification of IC engines?

Ans: IC engines can be classified as follows:-

1. According to the type of fuel used:-
   a) Petrol Engine b) Diesel Engine
2. According to the cycle of operation:-
   a) Four stroke cycle engine.
   b) Two stroke cycle engine.
3. According to the cooling system
   a) Air cooled engine
   b) Water cooled engine.
4. According to the charged pressure
   a) Naturally aspirated engine
   b) Supercharged / turbocharged engine for high capacity.

Q2: What is pump? What is priming?

Ans: **Pump:** It is a device which is having wide application in pumping of water, fuel, chemical, viscous fluid like lubricant.

Priming:- It is the process in which the impeller of a centrifugal pump is fully sub-merged into the liquid without any air trap inside.

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Q3: Explain the specific function of fuel pump and injector in diesel pump?

Ans: • Fuel Pump: The pump produces the high pressure necessary for injection, in the order of 100 - 400 bar, depending upon the engine size and the type of combustion chamber used.

It consists of plunger working in a barrel. The plunger is moved up against the action of spring by means of a cam. During the upward movement of the plunger, when the inlet and spill ports are closed, pressure is developed in the fuel and is sent to the injector through a delivery valve.

• Fuel Injector:- The lower portion of the fuel injector is described. The needle valve is kept in the seat by a helical spring. The tension of spring can be adjusted manually by a nut on the top of the injector to vary the pressure of injection.

Fuel under pressure from the fuel pump enters the pressure chamber through the fuel duct. Because of high pressure the needle valve is lifted up against the spring tension.

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Q4: We want to discharge water from lower head to a limited height but we need high discharge, so which type of pump we can use explain with proper working.

Ans: For this work we can use centrifugal pump. The main parts of centrifugal pump are:-

1. Impeller
2. Casing
3. Suction pipe fitted with a foot valve (one way valve) and filter, the foot valve will not allow the water to come down.
4. Delivery pipe.

(i) Impeller:- The impeller is a metallic disc fitted with a no. of curved vanes. Initially water will be poured inside the casing and the process is called priming. So, after priming, the impeller will be immersed in water inside the casing. When the impeller is rotated by an electric motor or an engine, it will produce centrifugal force due to which KE or velocity energy will be produced in the water.

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2. Casing:- The casing surrounds the impeller. The area between the impeller and casing is gradually increasing till the delivery pipe. Due to the reduction in K.E the pressure energy of water is increased. The following three types of casing are normally used.

- Volute Casing:- The gap between the impeller and casing is increased. However the size of the casing will be small and the cost will be less.
- Vortex Casing:- The space between the impeller and the casing is increased by introducing a circular chamber. As eddies are reduced, the efficiency of the pumps with the vortex casing is increased.
- Casing with Guide Vanes or Diffuser Casing:- The impeller is surrounded by a set of guide vanes or diffuser. The shape of the guide vanes should be carefully designed to ensure that the water flow from the impeller enters the guide vanes without shock. Gradual increase in area of guide vanes reduces the velocity of flow resulting in pressure increase.

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DETAILED LECTURE NOTES

Ques 5: What is the compression ratio? Explain the main component of IC engine?

Ans: The compression ratio is defined as $\frac{Vs+Vc}{Vc}$ where Vs is the stroke volume and Vc is the clearance volume.

- Main Components of IC Engine:-

(i) Cylinder:- The cylinder allows the piston to move to and fro. It is made of cast iron or steel or aluminium alloy.

(ii) Cylinder head:- It is fitted on the top of cylinder. It also accomodates the inlet valve and the spark plug.

(iii) Piston:- It transmits the force exerted by the burning gases to the connecting rod and finally to the crank shaft. The diameter of piston in a large marine engine is about 1m

(iv) Piston Rings:- Two different types of piston rings are housed in the circumferential grooved provided on the outer surface of the piston. The function of the lower rings is to scrap the used lubricating oil into

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piston

the crank case. These rings are called scraper rings.

(v) Connecting Rod :- This transmits the force from the piston to the crank shaft. It also helps in converting the reciprocating motion of the piston into the rotatory motion.

(vi) Crank Shaft :- Great care should be taken in the proper design of the crank shaft. The crank shaft is provided with suitable holes to help in the lubrication system.

(vii) Flywheel :- It is mounted on the crank shaft. The flywheel stores the excess energy during the power stroke of the engine and helps the movement of piston during the remaining idle strokes.

(viii) Cams :- Properly designed cams control the opening and closing of the inlet and exhaust valves in the case of four-stroke engines.

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Q6: State basic difference between 2 stroke and 4 stroke engine?

Ans:

4 Stroke Engine	2 Stroke Engine
(i) One working stroke for every 4 strokes or 2 revolution.	(i) One working stroke for every 2 strokes or one revolution.
(ii) The weight of engine is more for the same output power.	(ii) The weight of engine is considerably less.
(iii) Operating temperature is less, so less consumption of oil.	(iii) Operating temperature is more. So, more consumption of lubricating oil.
(iv) Noise is less	(iv) Noise is more due to exhaust.
(v) Higher thermal efficiency	(v) Thermal efficiency is less due to possible wastage of fuel-air mixture.
(vi) Straight piston is used	(vi) Deflector piston is used
(vii) Variation of torque is more	(vii) Smaller flywheel is enough as torque is more uniform.
(viii) Due to valve design of the cylinder head is difficult and cost is more	(viii) Easier in design and the manufacturing cost is less.

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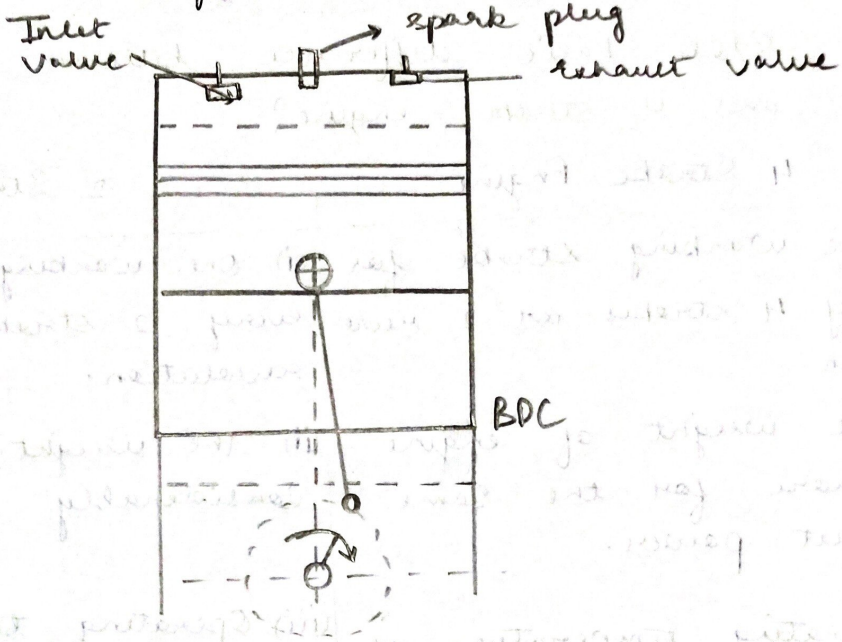
Qr: Explain the working of four stroke petrol with neat diagram?

Ans:



(i) Suction Stroke:- Inlet → open, Outlet → close. During this stroke, the inlet valve is kept opened and the exhaust valve is closed. The piston comes down to the bottom dead centre (BDC) from the (TDC). Petrol air mixture in the correct proportion from the Carburetter is drawn inside the engine cylinder through the inlet valve.

(ii) Compression Stroke:- Inlet → close, outlet → close. In this stroke, both the inlet and exhaust valves are kept closed. The mixture of petrol - air is compressed when the

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piston moves up to TDC. The compression ratio varies from 7-10 for petrol engines. At the end of the compression stroke, a spark is produced at the spark plug due to which combustion starts resulting in high pressure and temperature which are comparatively less than that of a diesel engine.

(iii) Working or Power Stroke :- Both valve closed during their stroke, both valves are kept closed. The piston is pushed down from TDC to BDC. The force above the piston is transmitted to the crank shaft through the connecting and crank mechanism.

(iv) Exhaust Stroke :- Inlet → close, outlet → open
During the stroke, the exhaust valve is kept opened and the inlet valve is kept closed. The piston moves up from BDC to TDC. The waste gases are sent out through the exhaust valve and the cycle is repeated.

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(Q8: Differences b/w Petrol and diesel engine:-

Ans:

PETROL ENGINES	DIESEL ENGINES
(i) Compression ratio is 7-10	(i) Compression ratio is 15-20
(ii) Petrol - air mixture is compressed	(ii) Only air is compressed
(iii) Compression pressure is 15-20 bar	(iii) Compression pressure is 30-40 bar.
(iv) Compression Temperature is about 400°C	(iv) Compression temperature is above 500°C.
(v) Peak pressure is in the range of 50-70 bar	(v) Peak pressure is high in the range of 80-100
(vi) Weight of engine is less	(vi) Weight of engine is more.
(vii) Cost of engine is less	(vii) Cost of engine is more
(viii) Due to low peak pressure thickness of parts is less.	(viii) Due to high pressure thickness of parts is more.
(ix) Spark plug is necessary to ignite the fuel - air mixture.	(ix) No need for spark plug as compression temperature is enough to ignite.
(x) Thermal efficiency is low in range of 20-25% due to low compression ratio.	(x) Thermal efficiency is high in range of 25-30% due to high compression ratio.

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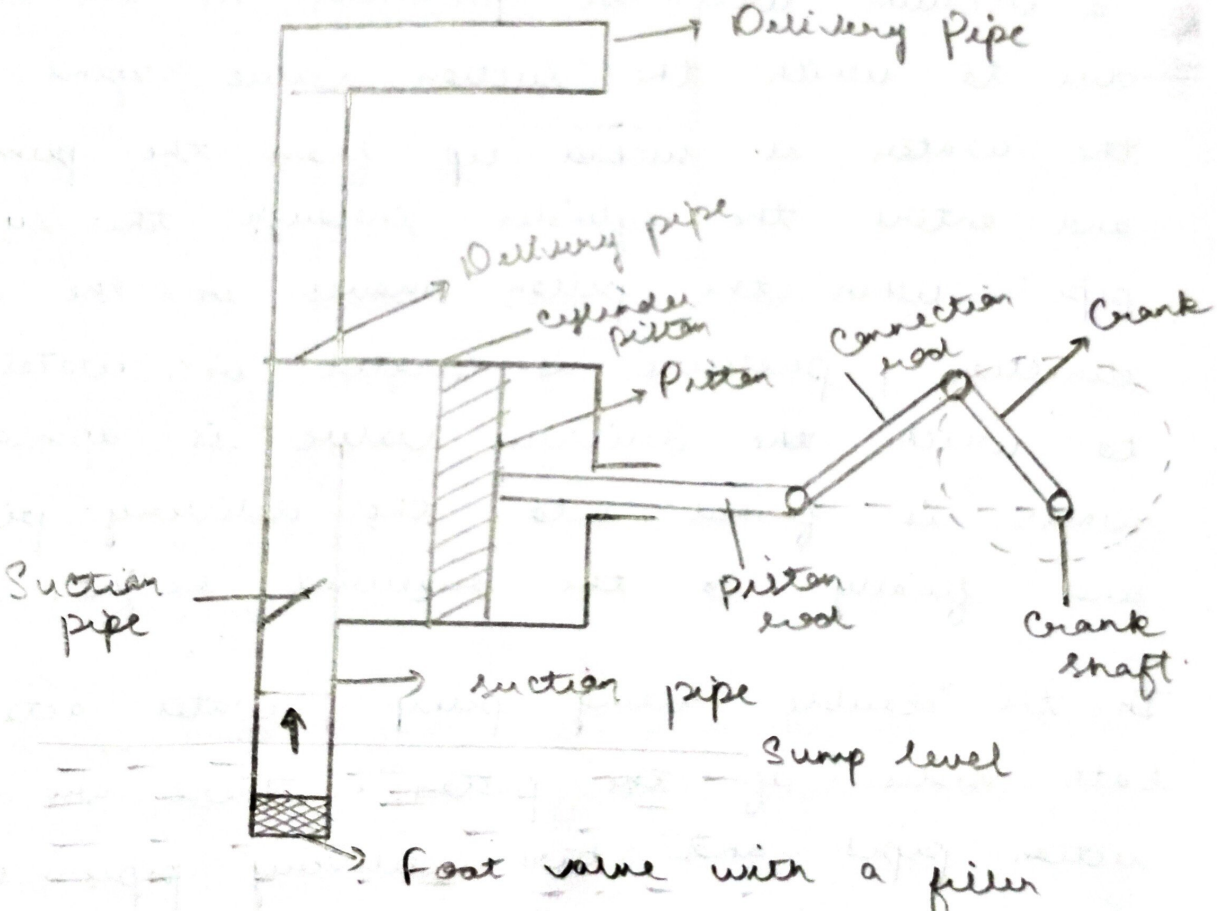
DETAILED LECTURE NOTES

Q9: Explain the working of reciprocating pumps with neat diagram?

Ans: SINGLE - ACTING RECIPROCATING PUMP :-



(i) Cylinder with a piston
(ii) Piston rod, connecting rod, crank and crank shaft
(iii) Suction pipe with a foot valve and filter
(iv) Delivery pipe
(v) Suction pipe

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(i) Delivery pipe.

The crankshaft is coupled to an electric motor or a diesel engine. When the motor or engine is started, the piston moves to and fro inside the cylinder. When the piston moves right in the direction of arrow a vacuum will be produced in the cylinder due to which the suction valve opens and the water is sucked up from the pump and enters the cylinder through the suction pipe. When the piston moves in the left direction, pressure is created in water due to which the delivery valve is opened and water is forced into the delivery pipe and finally to the required height.

In the double acting pump, water acts on both sides of the piston. There are two suction pipes and two delivery pipes. When there is a suction stroke on one side of the piston. Thus, for each revolution of the crankshaft there will be two delivery strokes and so, double the amount of water is delivered by this type of pump.

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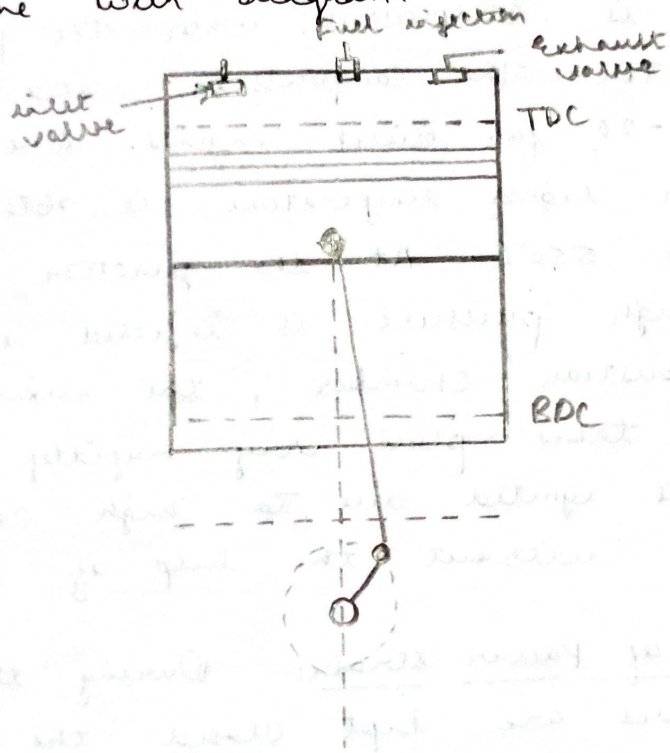
DETAILED LECTURE NOTES

Q10: Explain the working of 4 stroke diesel engine with diagram:-



In diesel engine there is no need of spark plug. Diesel engines are also called compression ignition engines.

1. Suction Stroke:- During this stroke, the inlet valve is kept opened and the exhausted valve is kept opened and the piston comes down to the bottom dead centre from the TDC.

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2: Compression Stroke:- In this stroke, both the inlet and outlet valves are kept close The air is compressed when the piston moves up to TDC. The compression ratio moves from 15-20 for diesel engines. Due to high compression higher temperature is obtained in the range 550°C. At the junction diesel oil at a high pressure is injected inside the hot combustion chamber, the mixing of fuel and air takes place very rapidly and the mixture is ignited due to high compression temperature without the help of spark plug.

3. Working of Power stroke:- During this stroke both valves are kept closed the piston is pushed down from TDC to BDC. The force above the piston is transmitted to the crank shaft through the connecting rod and crank mechanism.

4. Exhaust Stroke:- During this stroke the exhaust valve is kept opened and the inlet valve is kept closed. The piston moves up from BDC to TDC. The waste gases are sent through the exhaust valve and the cycle is repeated.

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SESSION 2022-23

Assignment Sheet-1

Campus: PCE Course: B.Tech. Class/Section: ..... Date: .....
Name of Faculty: ..... Name of Subject: BME Code: 1FY3/2FY3-07
Date of Preparation:..... Scheduled Date of Submission: .....

		Marks	CO	BL	PO
Q.1	What is pump? What is priming?	1	CO1	L1	PO1
Q.2	Describe the classification of IC engines?	1	CO1	L1	PO1
Q.3	What are the differences between fire tube and water tube boilers?	1	CO2	L2	PO1
Q.4	What are the differences between impulse and reaction impulse turbine?	2	CO2	L2	PO1
Q.5	State basic difference between 2 stroke and 4 stroke engines.	2	CO2	L2	PO1
Q.6	What are steam boilers? State some applications of steam boilers?	2	CO3	L3	PO1
Q.7	We want to discharge water from lower head to a limited height but we need high discharge, so which type of pump we can use explain with proper working.	2	CO3	L3	PO1
Q.8	What are the main parts of steam turbine? What is the function of steam nozzle?	2	CO3	L3	PO1

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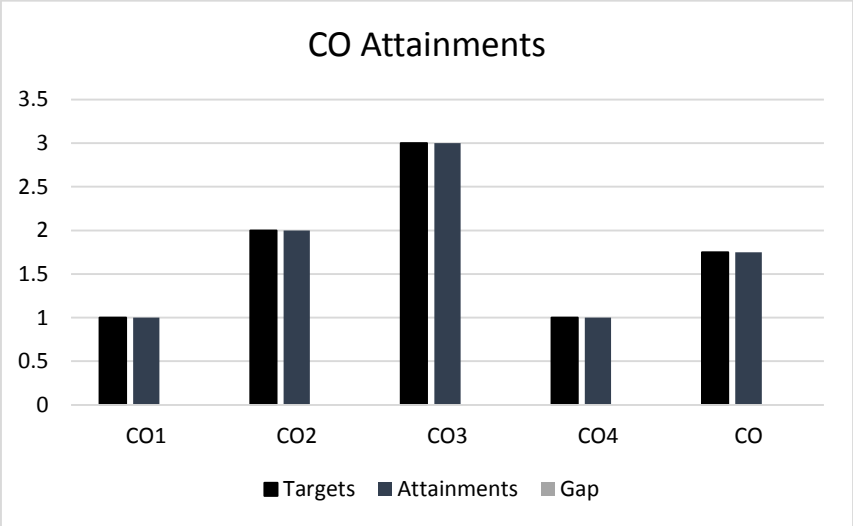
Attainment of CO with CO-Gap Identifications and Activities Decided to bridge the gap:

CO-Gap Identifications for Assignment 1:

CO Attainments					
Overall CO Attainments for PO	CO1	CO2	CO3	CO4	CO
Targets	1.00	2.00	3.00	1.00	1.75
Attainments	1.00	2.00	3.00	1.00	1.75
Gap	0.00	0.00	0.00	0.00	0.00



Gaps Identified for Assignment 1:

Describe what the reasons for gaps are:

- No Gap

Activities Decided to bridge the gap after Mid-1:

- Notes were circulated to the students related to the IC engine and revised the important definition.

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DETAILED LECTURE NOTES

UNIT - 2 Pumps & I C Engines

Campus: ..... Course: ..... Class/Section: ..... Date: .....
Name of Faculty: ..... Name of Subject: ..... Code: .....

Pumps

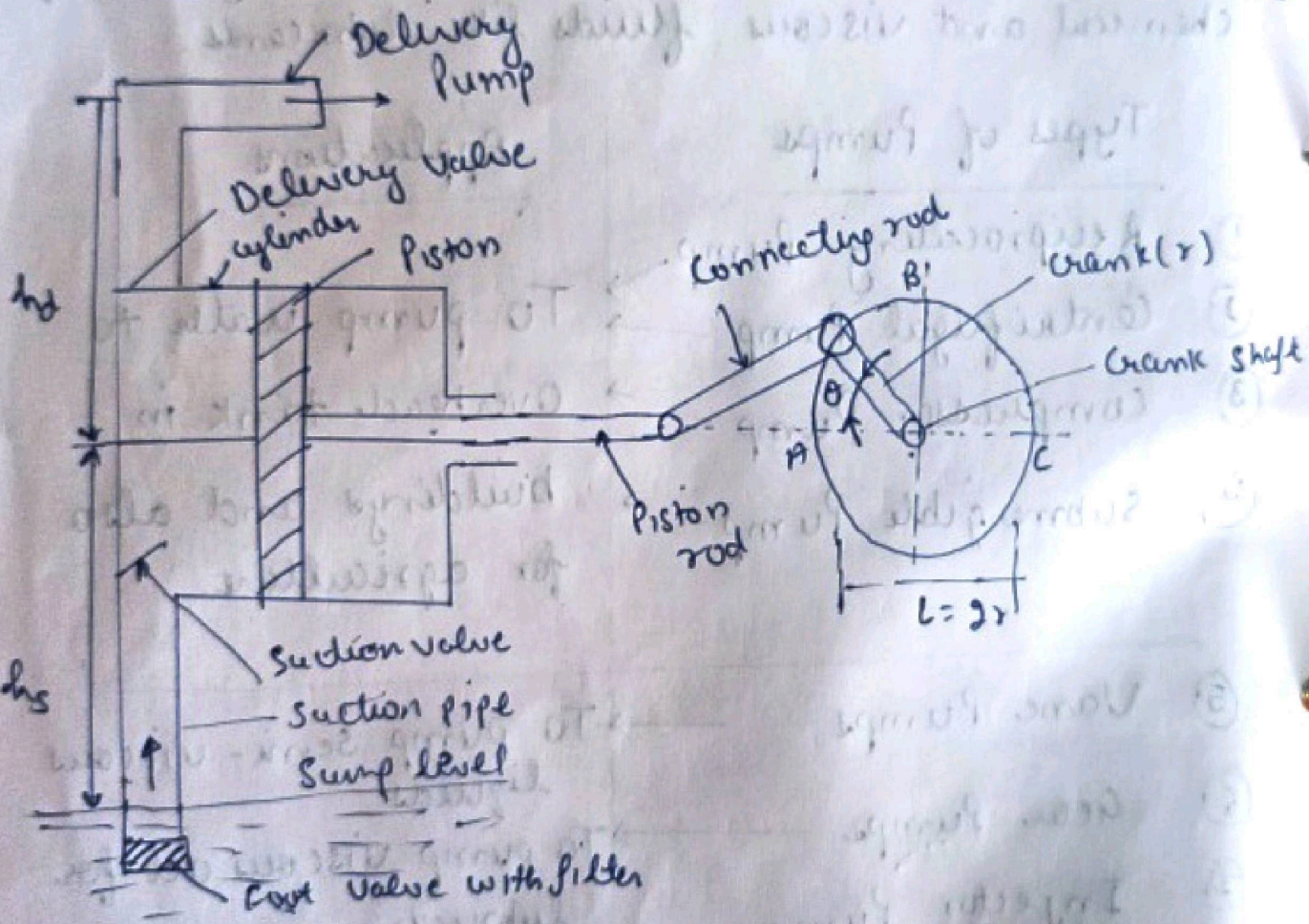
→ has wide range of application in pumping water, fuel chemical and viscous fluids like lubricants.

Types of Pumps	Applications
① Reciprocating Pump →	To pump water to Overhead tank in buildings and also for agriculture.
② Centrifugal Pump →	
③ Compressor Pump →	
④ Submergible Pump →	
⑤ Vane Pumps →	To pump semi-viscous liquids.
⑥ Gear Pumps →	To pump viscous oil for lubrication.
⑦ Injector Pump →	To pump boiler feed water during its operation
⑧ Different types of fuel Pump →	To pump petrol or diesel oil in IC engines
⑨ Screw Pump →	To pump liquid mixed with solid materials

Reciprocating Pumps

- Single acting
- Double acting

Working of a single acting Reciprocating Pump



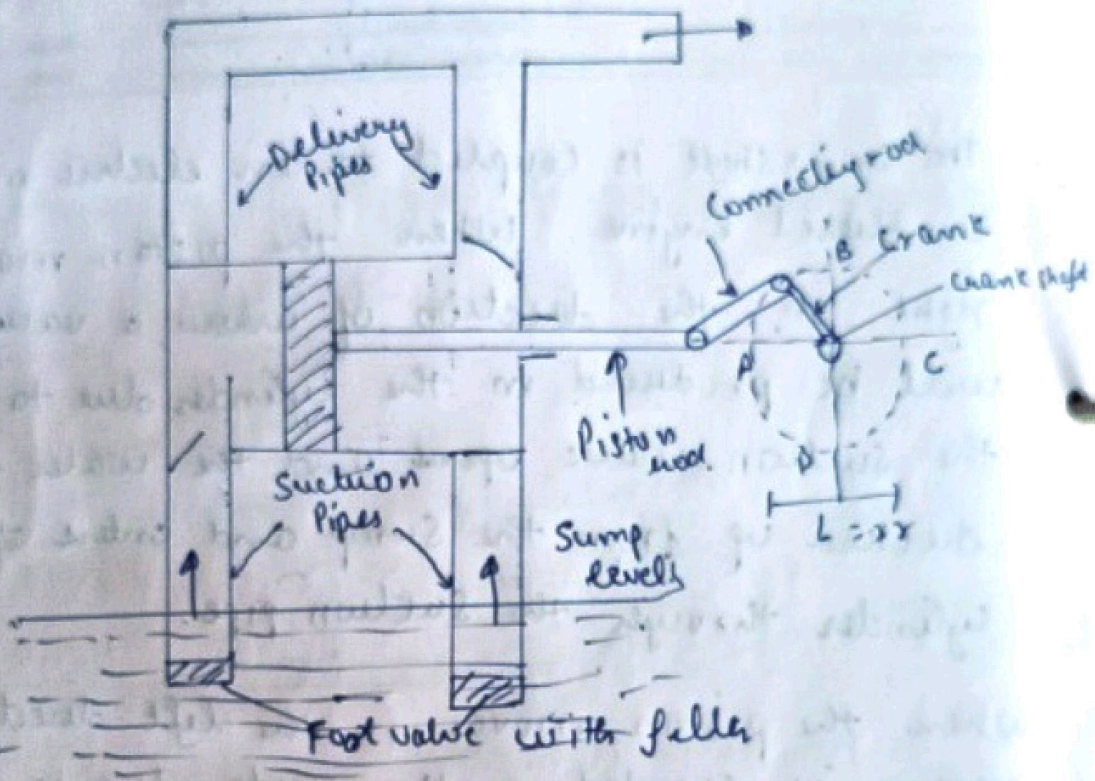
→ The crankshaft is coupled to an electric motor or diesel engine. When the piston moves right in the direction of arrow, a vacuum will be produced in the cylinder due to which the suction valve opens and the water is sucked up from the sump and enters the cylinder through the suction pipe.

→ When the piston moves in the left direction. pressure is created in the water due to which the delivery valve is opened and water is forced into the delivery pipe and finally to the required height.

Parts of Single acting Pump →

1. cylinder with piston
2. Piston rod, connecting rod, crank and crankshaft
3. suction pipe with a foot valve
4. Delivery pipe
5. Suction valve
6. Delivery valve.

Working of a Double acting Pump.



In double-acting, water acts on both side of the piston. There are two suctions pipes and two delivery pipes. When there is a suction p stroke on one side of the piston, there will be a delivery stroke on the other side of the piston. Thus, for each revolution of the crankshaft, there will be two delivery strokes and so, double the amount of water is delivered by this type of pump.

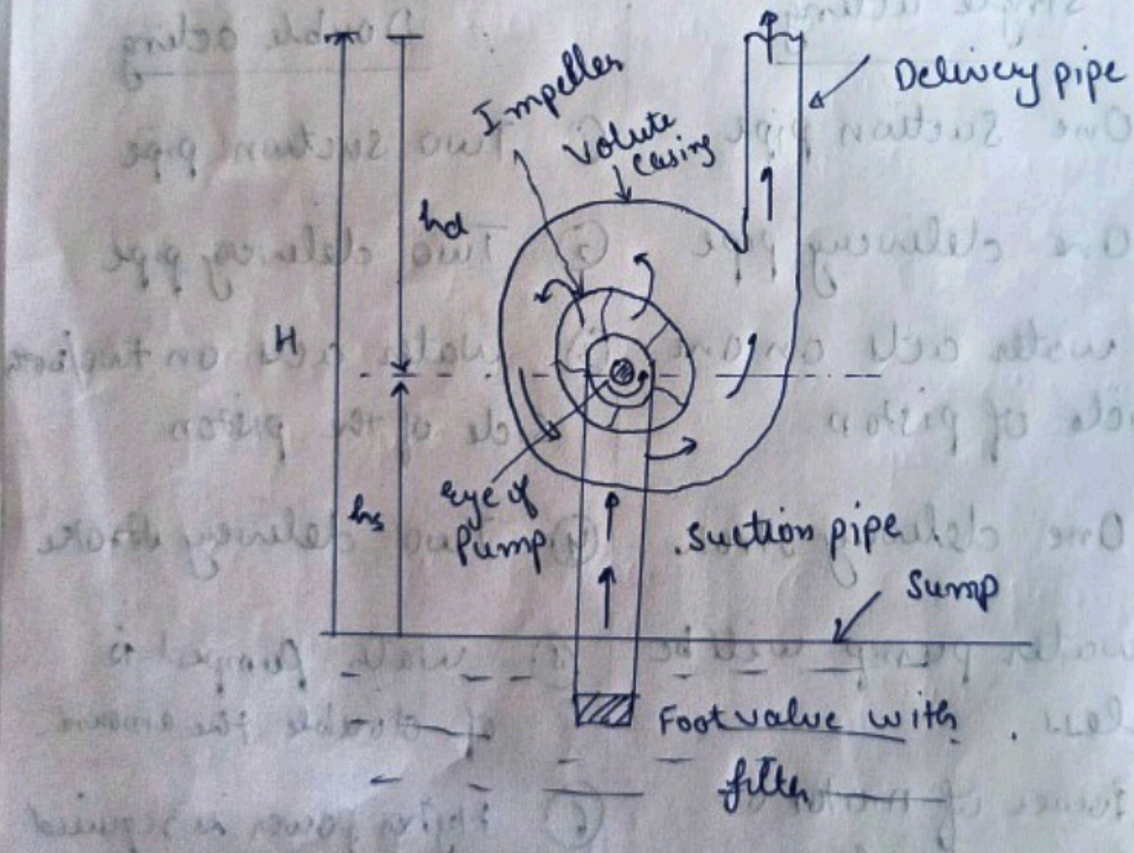
Difference b/w single acting and Double acting Pumps

Single acting	Double acting
(1) One suction pipe	(1) Two suction pipe
(2) One delivery pipe	(2) Two delivery pipe
(3) water acts on one side of piston.	(3) Water acts on two/both side of the piston
(4) One delivery stroke	(4) Two delivery stroke
(5) water pump will be less	(5) Water pumped is of double the amount.
(6) Power of motor or engine is less.	(6) Hyher power is required
(7) Cost is less	(7) Cost is more.

Centrifugal Pump →

Main parts are →

1. Impeller
2. Casing
3. Suction pipe fitted with foot valve, filter
4. Delivery pipe



Difference b/w Reciprocating Pump and centrifugal Pump →

Reciprocating Pumps	centrifugal Pump
(1) Can be used for high head	(1) Medium head
(2) Can pump less quantity.	(2) Large quantity can be pumped.
(3) Discharge is not continuous	(3) Continuous flow
(4) Cost is high	(4) Cost is low
(5) Cannot be run at high speed.	(5) Can run at high speed.
(6) Cannot pump viscous fluid.	(6) Can pump viscous fluid.

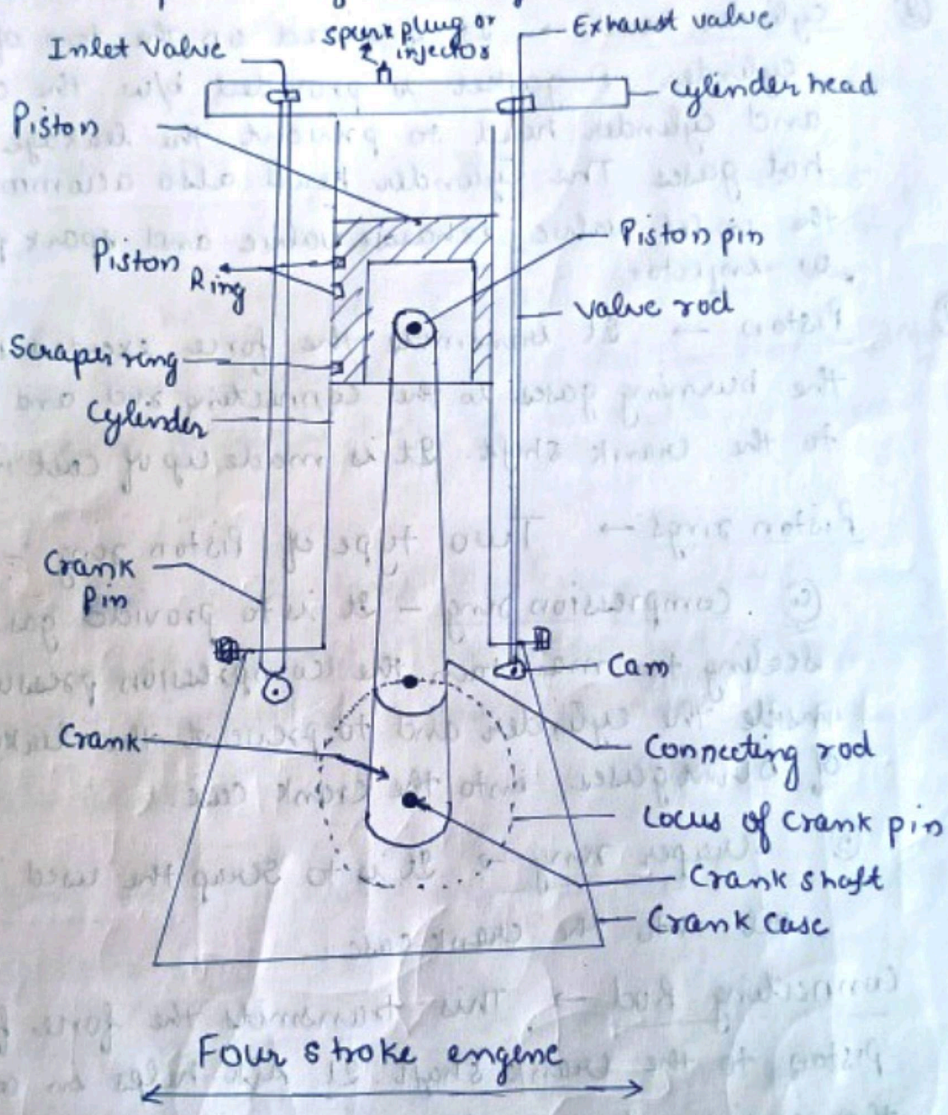
IC Engine

Petrol and diesel engine are classified as IC engines, having extensive applications in transport by road road, rail, sea and air.

Classification of IC Engines →

1. According to the type of fuel used
   - (a) Petrol engine
   - (b) Diesel engine
2. According to the cooling system
   - (a) Air cooled engine
   - (b) water cooled engine
3. According to the cycle of operation
   - (a) Four stroke cycle engine
   - (b) Two stroke cycle engine
4. According to the charge pressure
   - (a) Naturally aspirated engine
   - (b) Supercharged / turbocharged engine for higher capacity.
5. According to the no. of cylinder
   - (a) Single cylinder engine
   - (b) Multicylinder engine

Main component of I C Engine →



Four stroke engine

① Cylinder → The cylinder allows the piston to move to & fro. The cylinder is made of cast iron or steel or aluminium alloy.

② Cylinder head → It is fitted on the top of the cylinder. A gasket is provided b/w the cylinder and cylinder head to prevent the leakage of hot gases. The cylinder head also accommodates the inlet valve, exhaust valve and spark plug or injector.

③ Piston → It transmits the force exerted by the the burning gases to the connecting rod and finally to the crank shaft. It is made up of cast iron, steel.

④ Piston rings → Two type of Piston ring :-

ⓐ Compression ring – It is to provide gas tight sealing to maintain the compression pressure inside the cylinder and to prevent the leakage of burnt gases into the crank case.

ⓑ Scraper ring → It is to scrap the used lubricating oil into the crank case.

⑤ Connecting Rod → This transmits the force from the piston to the crank shaft. It also helps in converting the reciprocating motion of the piston into the rotary motion of the crank shaft. For the lubrication of

the piston pin in the connecting rod, a small hole is provided from the big end to the small end.

The small end of the connecting rod is attached to the piston by a gudgeon pin or piston pin.

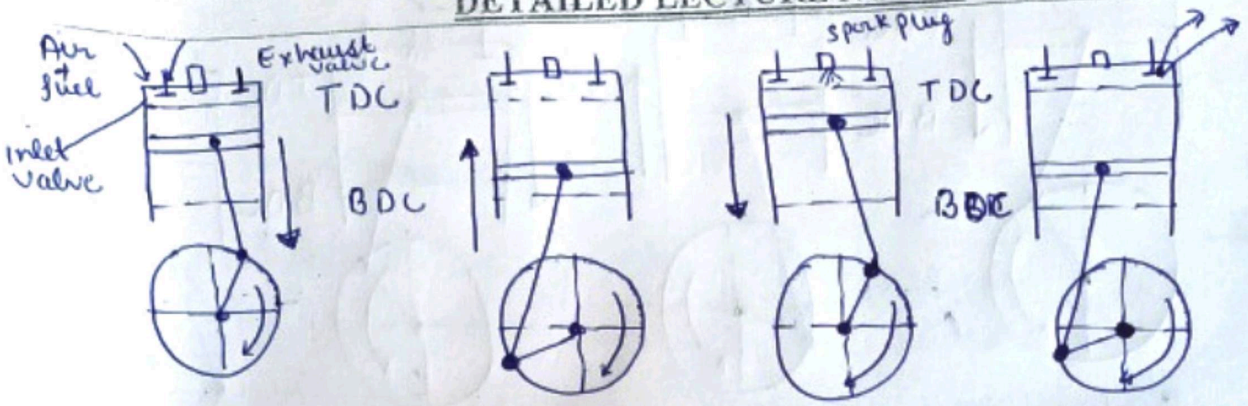
(6) Crank shaft → It is provided with suitable holes to help in the lubrication system. The Crank case serves as a sump for the lubricating ~~Suitable holes to help the in the lubrication system~~ oil.

(7) Flywheel → It stores the excess energy during the power stroke of the engine and helps the movement of the piston during the remaining idle strokes.

(8) Cams → Properly designed cams controls the opening and closing of the inlet and exhaust valves in the case of four stroke engines. Cams are rotated by a cam shaft driven by the crank shaft through gears.

4- Stroke - Petrol Engine →

DETAILED LECTURE NOTES



Suction Compression Expansion Exhaust

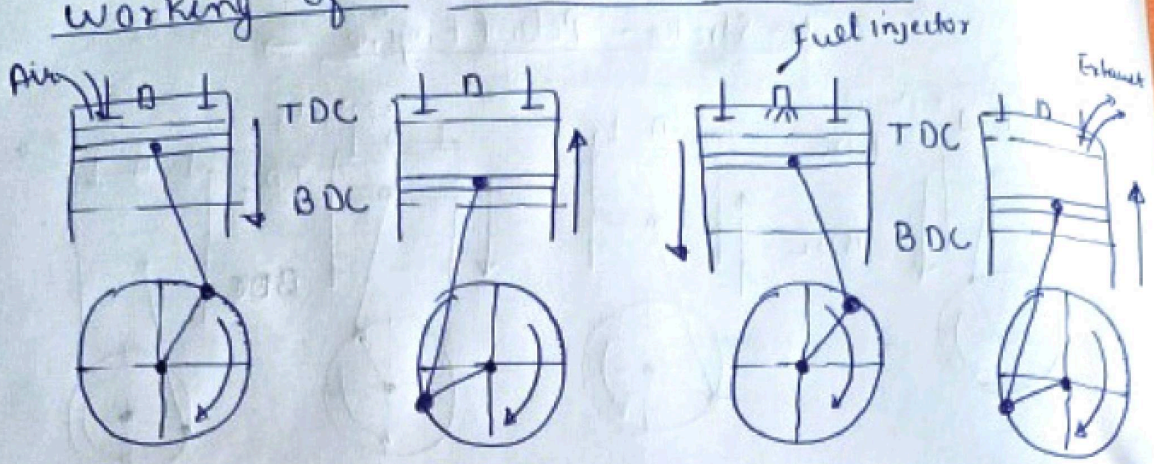
Suction → Inlet valve opens & Exhaust valve closed Air + fuel mixture enters and pressure in cylinder is less than atmospheric pressure.

Compression → Both inlet & exhaust valve closed Piston move from BDC to TDC and compression ratio varies 7 - 10 for petrol. At the end of compression a spark is produced at the spark plug.

Working → Both valve closed and piston is pushed down from TDC to BDC. Force is transmitted to crank shaft. Excess energy is stored in Flywheel which helps for the operation of idle stroke (three)

Exhaust → Exhaust valve is opened & inlet valve is closed Piston move from BDC to TDC and waste gases are sent out through exhaust valve & cycle is repeated.

Working of 4-stroke Diesel Engine



Suction	Compression	Expansion	Exhaust
Inlet valve → open Outlet valve → Closed	Closed Closed	Closed Closed	Closed Open
Piston moves → TDC ↓ BDC	BDC ↓ TDC	TDC ↓ BDC	BDC ↓ TDC
Air is entered in the suction stroke and pressure is less than atmospheric pressure	Compression ratio is about 15-20 bar at the end fuel is injected in the chamber High pressure is produced due to Compression	Force are transmitted to crankshaft and Power is stored in flywheel for idle stroke	Exhaust Gases comes out and process or cycle is repeated

Difference b/w Petrol Engine & Diesel Engine

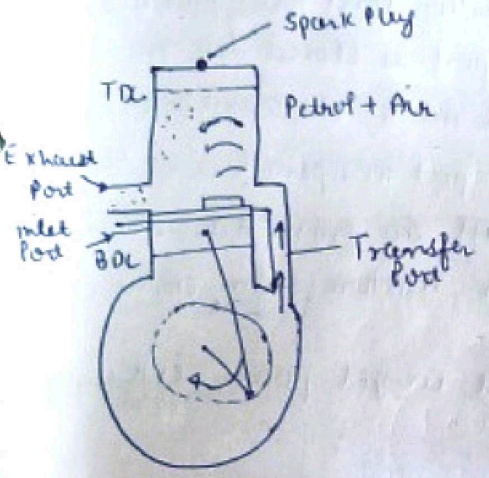
	Petrol (SI)	Diesel (CI)
①	Compression ratio is 7-10	Compression ratio is 15-20
②	Petrol + Air mixture is compressed	Only air is compressed
③	Compression temp is about 400°C	Compression temp is about 550°C
④	Compression pressure is 15-20 bar	Compression pressure is 80-100 bar
⑤	Thermal efficiency is low & about 20-25%	Thermal efficiency is High & about 25-30%.
⑥	Spark plug for ignition the fuel + air mixture	No need of spark plug
⑦	weight of engine is less	weight of engine is more
⑧	Cost of engine is less	Cost of engine is more.

Page No.:

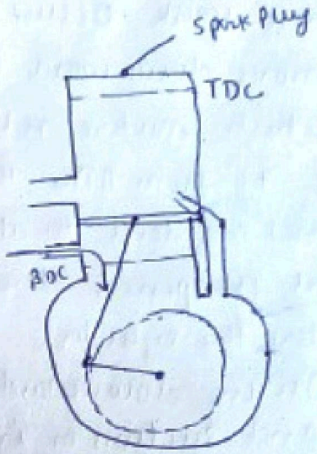
Difference b/w 4-stroke & 2-stroke engine

4-stroke engine	2-stroke engine
① One working stroke for every 4 stroke.	① One working stroke for every 2 stroke.
② Power output is less.	② Power output is more
③ weight of engine is more	③ weight of engine is less
④ operating temp^{r} is less	④ operating temp^{r} more
⑤ variation of torque is more	⑤ variation of torque is less.
⑥ Noise is less	⑥ Noise is more
⑦ Higher thermal efficiency	⑦ Thermal efficiency is more less.
⑧ Straight piston is used	⑧ Deflector piston is used.

Working of Two-stroke Petrol Engine →



Downward movement of piston



upward movement of piston

When the piston is pushed up by the flywheel, the following sequence of operation take place:

1. closing of transfer port
2. closing of exhaust port
3. Opening of inlet port

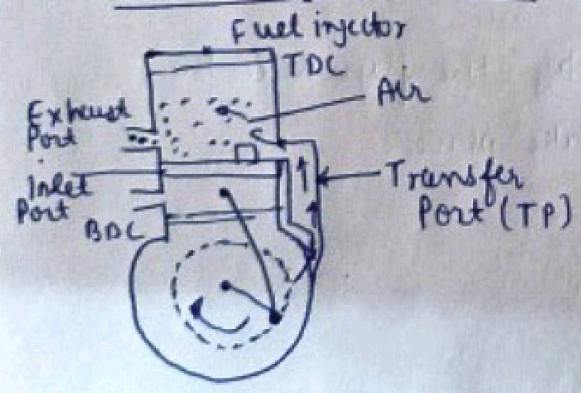
These ports are opened & closed by the movement of piston itself. The exhaust port is located slightly above the transfer port.

→ The mixture of air & fuel is drawn into the crank case due to the vacuum produced by the upward movement of piston. Also mixture above the piston is compressed The compression ratio for a petrol engine varies from 7 - 10.

When spark occurs, the combustion start and piston is move downward and inlet port is closed due to which mixture get compressed inside the crank case. At 70° from BDC, the exhaust port is opened and the gases are sent to atmosphere. At 60° from BDC, the transfer port is opened due to which mixture from crank case enters the cylinder.

→ During downward movement we get power, exhaust and suction or intake.

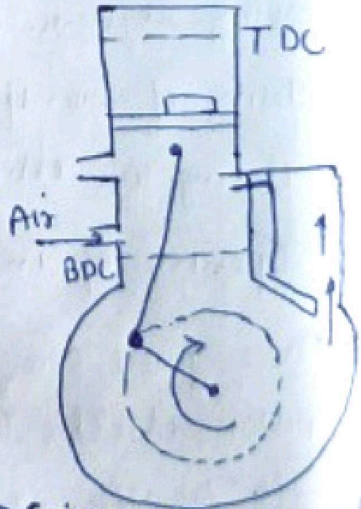
Working of Two-Stroke Diesel engine →



→ First, we get power for 110° crank rotation
→ Then exhaust begins
→ Later Suction Start through TP

→ Downward movement of Piston

upward movement of the piston



→ First Suction completed
→ Exhaust completed
→ Compression for 110° till TDC

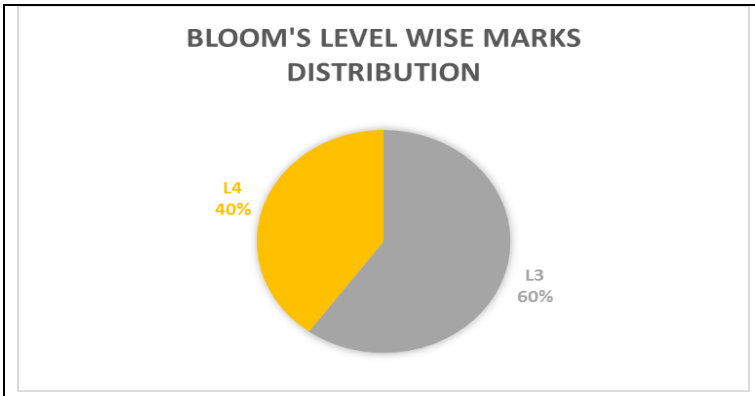
POORNIMA COLLEGE OF ENGINEERING

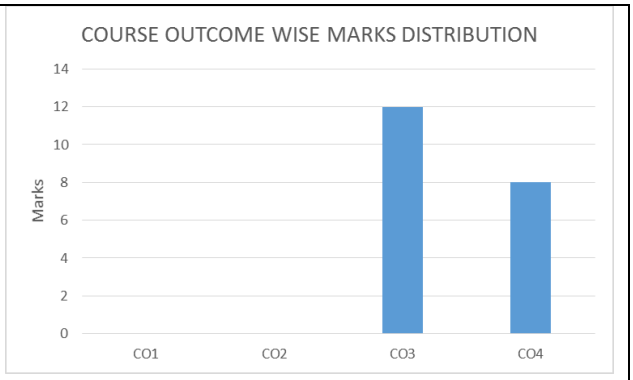
SESSION 2023-24

OBT

Campus: PCE Course: B.Tech. Class/Section: ……Date: …….
Name of Faculty: Name of Subject: BME Code: 1FY3/2FY3-07
Date of Preparation:…….. Scheduled Date of Submission: …….

	QUESTION	Marks	CO	PO
Q1	How metals are classified? Show with block diagram.	**4**	**CO4**	**PO2**
Q2	Find the power transmitted by the belt running over a pulley 600 mm diameter and running at 200 Rpm. if the coefficient of friction between belt and pulley is 0.25 and the angle of lap is given as 160 degrees. Take Maximum Tension in the belt as 2500 N	**4**	**CO4**	**PO2**
Q3	Define the terms: Hardness, Toughness, Ductility, Elasticity with example.	**4**	**CO3**	**PO1**
Q4	What are casting defects ?	**4**	**CO3**	**PO1**
Q5	Distinguish between welding, brazing and soldering. Which process produces the strongest joints and why?	**4**	**CO3**	**PO1**





BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 –

Analyzing, 5 – Evaluating, 6 - Creating)

CO – Course Outcomes; PO – Program Outcomes

POORNIMA COLLEGE OF ENGINEERING, JAIPUR _ Campus: PCE Course:

B.Tech. Class/Section: .....

Date: ..... Name of Faculty:

Name of Subject: BME Code: 1FY3-07

Date of Preparation:.....

Scheduled Date of Submission: .....

QUIZE-1

*Required

1. Email *

2. NAME *

3. Roll No.

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4. **Q1** A process, in which the gas is heated or expanded in such a way that the product of its pressure and volume remains constant, is called 1 point

Mark only one oval.

- ◯ Isothermal process
- ◯ Isobaric process
- ◯ Adiabatic process
- ◯ Polytropic process

5. Q2 Which of the following is not a thermodynamic property? 1 point

Mark only one oval.

- ◯ Pressure
- ◯ Temperature
- ◯ Heat
- ◯ Specific volume

6. Q 3 Atmospheric pressure is equal to 1 point

Mark only one oval.

- ◯ 1.013 bar
- ◯ 101.3 kN/m2
- ◯ 70 mm of Hg
- ◯ All the above

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1 point

7. Q 4 First law of thermodynamics deals with

Mark only one oval.

- Conservation of heat
- Conservation of momentum
- Conservation of mass
- Conservation of energy

1 point

8. **Q 5 One ton of refrigeration is equal to _____**

Mark only one oval.

- 120 B Th U/hr
- 200 B Th U/hr
- 1200 B Th U/hr
- 12000 B Th U/hr

1 point

9. **Q 6 Pump transfers input mechanical energy of an engine, into _____**

Mark only one oval.

- pressure energy of a fluid
- Kinetic energy of a fluid
- Both a & b
- None of the above

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10. **Q 7 Thermal efficiency of S.I. engines is low, due to ___** 1 point

Mark only one oval.

- low compression ratio
- high compression ratio
- Both a & b
- None of the above

11. **Q 8 Which of the following relations is true, for coefficient of performance (C.O.P)?** 1 point

Mark only one oval.

- (C.O.P)heat pump – (C.O.P)refrigerator = 1
- (C.O.P)heat pump – (C.O.P)refrigerator > 1
- (C.O.P)heat pump – (C.O.P)refrigerator < 1
- (C.O.P)heat pump – (C.O.P)refrigerator = 0

12. **Q 9 Lancashire boilers are _____** 1 point

Mark only one oval.

- externally fired boilers
- internal fired boilers
- Both a & b
- None

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13. **Q 10 Which of the following energy conversion devices convert heat into work?** 1 point

Mark only one oval.

- ◯ Electrical generators
- ◯ IC Engine
- ◯ Condenser
- ◯ All the above

14. Q 11 What is a steam turbine? 1 point

Mark only one oval.

- ◯ Machine that uses pressurised steam to extract mechanical energy
- ◯ Machine that uses pressurised steam to extract thermal energy
- ◯ Machine that uses pressurised steam to extract kinetic energy
- ◯ Machine that uses pressurised steam to extract electrical energy

15. Q 12 Which of the following is a type of turbine classified based on the fuel that supplies the driving force? 1 point

Mark only one oval.

- ◯ Steam Turbine
- ◯ Gas Turbine
- ◯ Wind Turbine
- ◯ All of the mentioned

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16. Q 13 What is the combustion in spark ignition engine? 1 point

Mark only one oval.

- ◯ heterogeneous
- ◯ laminar
- ◯ homogeneous
- ◯ none of the mentioned

17. Q 14 The refrigerants which are first cooled by _____ refrigerants and then used for cooling purposes are known as _____ refrigerants. 1 point

Mark only one oval.

- ◯ secondary, primary
- ◯ primary, secondary
- ◯ tertiary, primary
- ◯ secondary, tertiary

18. Q15 What is the difference between Heat Pump and Refrigerator? 1 point

Mark only one oval.

- ◯ Heat Pump Gives efficiency and refrigerator gives C.O.P.
- ◯ Both are similar
- ◯ Both are almost similar, just the desired effect is different
- ◯ Work is output in refrigerator and work is input in heat pump

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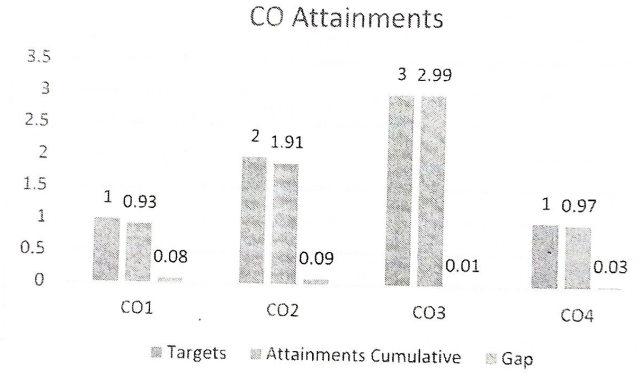
CO-Gap Identifications for Quiz/ 1:

CO Attainments						
Overall CO Attainments for PO	CO1	CO2	CO3	CO4	CO5	CO
Targets	1.00	2.00	3.00	1.00		1.75
Attainments OBT-1			3.00	1.00		1.75
Till Tut/Asn-2	0.93	1.91	2.98	0.94		1.65
Attainments Cumulative	0.93	1.91	2.99	0.97		1.70
Gap	0.08	0.09	0.01	0.03		0.05



Gaps Identified for Quiz 1:

Describe what the reasons for gaps are:

- 5 Students were not able to give the proper explanation of problems related to power transmission. Due to this reason the values of CO3 is showing the gap.
- 4 students were not able to give the proper reply of Basic definition correctly.

Activities Decided to bridge the gap after Mid-2:

- Notes were circulated to the students related to the IC engine and revised the important definition.

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[FOR SECRECY SECTION]

OBT ⇨

1] Gears trains are gear constituents one of the modes of transmission of power from one shaft to another, however they are used when the distance b/w the driver the driven shaft is relatively small. A gear train can be defined as a mechanism which transmits power or motion from one shaft to another shaft with the help of gear wheels.

2] Q_1 = Diameter of the driver

600 mm = 0.6 mN_1

⇒ Speed of the driven in Rpm = 2000 Rpm

μ = coefficient of friction

0.25θ = angle of contact

160 = 1600 × (π/180) = 2.79 Rad.

Angles of lap is always less than 10° so it is angle of contact which is always greater than 150° always in radian.

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T_1 = Maximum Tension

T_2 = Tension in the slack side of the belt

V = Velocity of the belt ~~in m~~ in m/sec

$= \frac{\pi D N}{60}$.

D is in metre & N is in Rpm

P = power transmitted by belt drive.

We know that

$P.T = (T_1 - T_2) . V$ KW; T_1 & T_2 in KN

Here T_2 & V is unknown

calculation for V

$V = \pi D N / 60$ m/sec

D is in meter & N is in Rpm putting all the value.

$V = \frac{(3.10 \times 0.6 \times 200)}{60} = 6.28$ m/sec — (1)

calculation for T_2;

We know that ratio of belt tension.

$T_1 / T_2 = e^{\mu \phi}$,

. putting the value,

$\Rightarrow T_2 = 1.24$ KN

$\Rightarrow P = (2.5 - 1.24) \times 6.28$ — (2)

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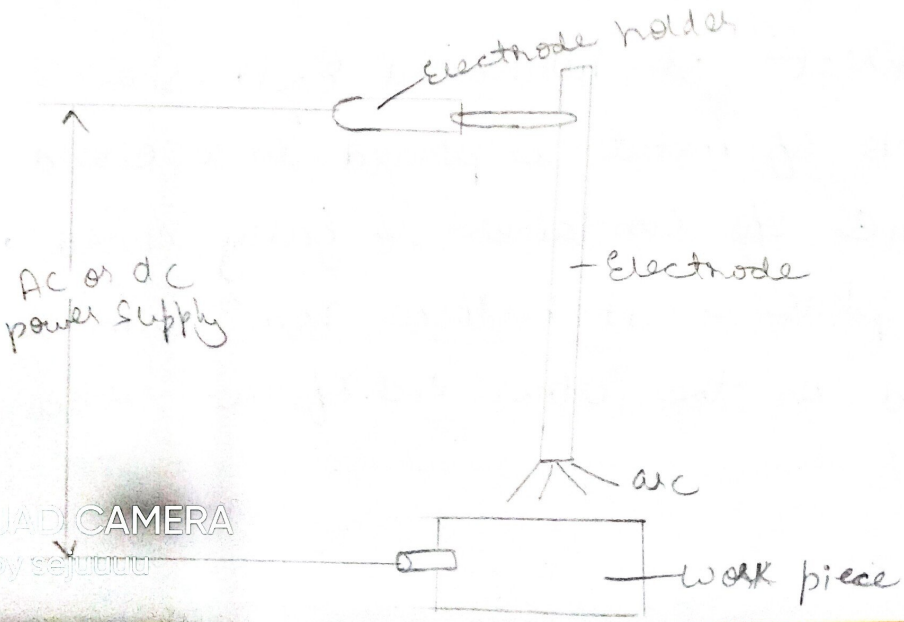
3] Brazing & soldering join material usally metals, together by flowing a filter metal into the joint. In both cases the filter metal has a lower melting point then the base metals ~~test~~ ~~leaving joint~~ having joined

- Arc welding is the process of joining to metals pieces by melting their Edges with an Electric arc.

Arc welding is welding using the heat of an arc as a heat source. In arc welding. positive voltage is applied to the Electrode & negative voltage is applied to the base material this an arc occur from the lease material to the Electrode.



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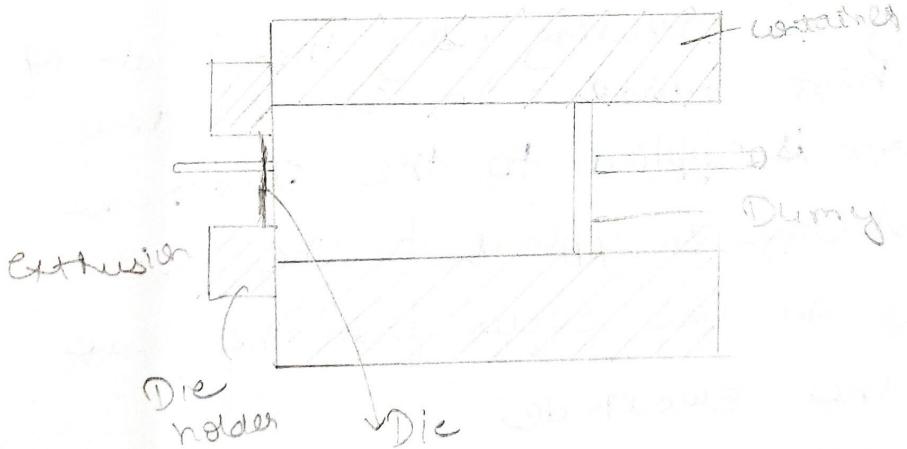
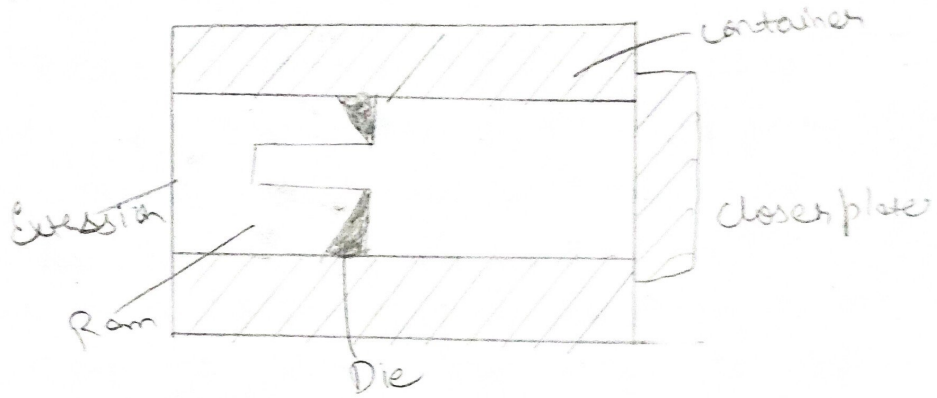
T → Maximum Tension

4] Extrusion Process is a metal forming operation in which a block of metal is reduced to desired shape & size by confining it in a closed container & then forcing it to flow only through a die orifice under high pressure.

(i) Direct or forward Extrusion :-
A block of metal is placed in a closed container & at one end die is placed & a ram at other end. Or contain dummy block or pressure ram is connected to direct contact of the heat metal & ram.



(ii) Indirect or backward Extrusion :-
A block of metal is placed in a closed container & at one of container is fully closed by a closure plate. A hollow ram with die is placed on the other end of the container.



5] Engineering materials refers to the group of materials that are used in the construction of mass made structures & component.

The primary function of an Engg. material is to be with stand applied loading without breaking & without exhibition excessive diflection.

Working of cupola furnace :-

When the coke is very hot, solid pieces of metals are charged into the furnace through an opening in the top. The metal is alternates with additional layers of fresh coke.

lime stone is added to act as a flux.

As the heat rises within the stack the metal is melted.

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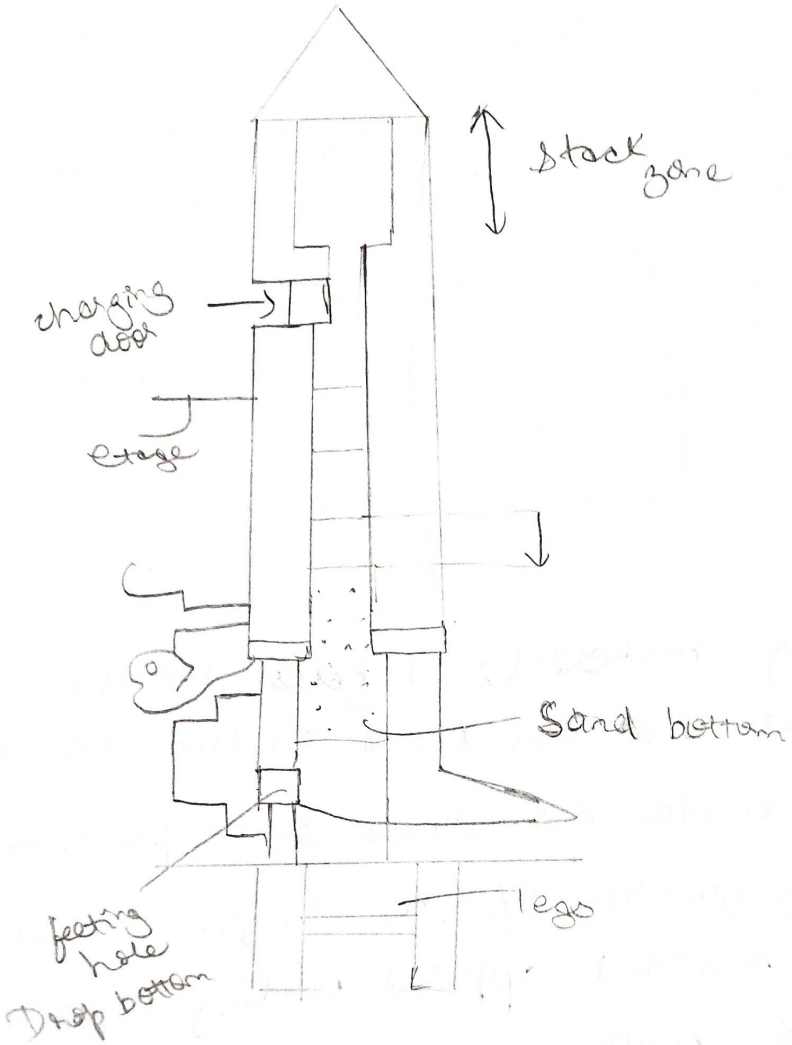
stack zone
charging door
stage
Sand bottom
legs
feeting hole
Drop bottom

OBJ → 1

1] Working of steam power plant :-

Steam from the boiler is taken be the turbine & with the same shaft generator is attached that generates Electrically Wasted steaming from turbine is sent to condenser pump is attached to condenser by the help of pump, hot steam is again sent to the boiler.



2] Working of Refrigeration System :-

The Vapour compression refrigeration system is widely used in refrigerator application like refrigerator water coolers AC cooled storage. The refrigerant Enters the Evaporator as wet Vapour at lower temp. pressure. Here it observe latent heat of Vapourisation from the substance cool them. Now it enters the compressor which is heart of the system. The refrigerant Vapour is compressed to higher pressure & higher temp. as super heated Vapour. The

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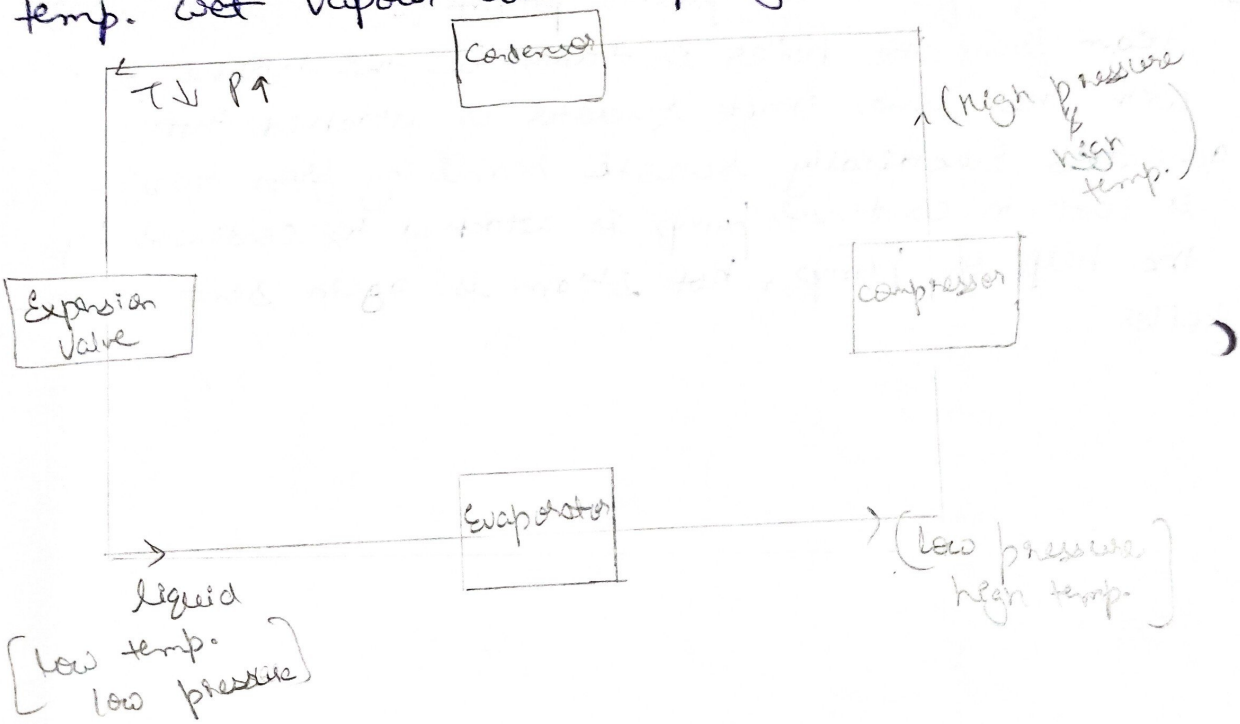
atmospheric air below over the condenser using a fan it carries away the content heat from the refrigerant vapour. the refrigerant vapour is condensed into high pressure liquid. The liquid refrigerant enters the expansion valve. here the refrigerant is throughed to low pressure, low temp. wet vapour does completely the cycle.



3) Working of Reciprotating pump :-

when the cranks connected the power source. it will start reacting of the connecting rod of the crank will also be in movement. As the piston is attached to the connecting rod is also start moving in a linear direction when the crank is moved outward, the piston moves to right creating a vacuum in the cylinder this causes the suction value to open. Now the liquid from the source is sucked into the cylinder by suction pipe.

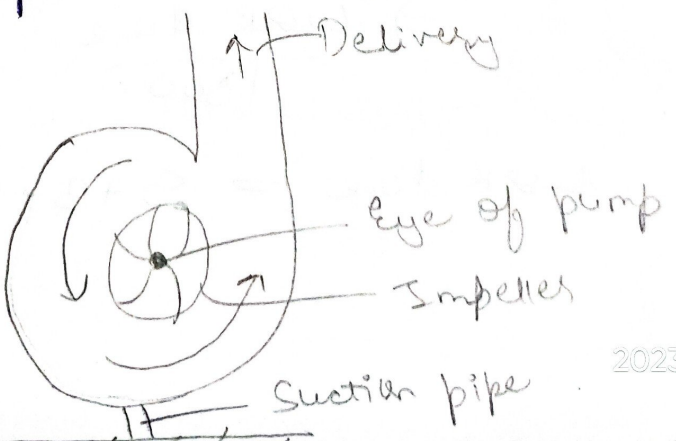
Industrial application

i) Oil drilling
ii) Vehicle cleaning
iii) Boiler feeding
iv) Refineries

Centrifugal pump :- Based on the application of centrifugal force

Working :-

A centrifugal pump is a mechanical device desined to move a fluid by means of the transfer of rotational Energy from one or more driven rotor, called impeller, fluid enters the rapidly rotating impeller along it axis in cast but by centrifugal force along it circumference through the impeller Vane tips.



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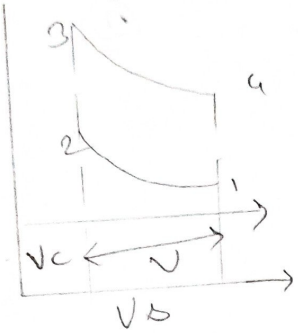
(final coding)

Given ; Clearance Vol. ⇒ 196.3 cc

⇒ 0.0001963 m^3

Stroke lenght ⇒ $V_s = \frac{\pi}{4} d^2 \times L$



$\Delta = 10\,cm$

$l = 15\,cm$

$V_s = \frac{\pi}{4} \times 10^2 \times 15 \Rightarrow 1178.09\,cc$

Compression Ratio :-

$r = \frac{V_s + V_c}{V_c} = \frac{1178.09 - 196.5}{196.3} \Rightarrow 7$

$\int_{Otto} \Rightarrow 1 - \frac{1}{r^{c-1}} \Rightarrow 1 - \frac{1}{7^{1.4-1}} \Rightarrow 1 - \frac{1}{7^{0.4}}$

taking $e = 1.4$

$\eta_{otto} = 0.5408$

$\eta_{otto} = \frac{\text{work done}}{\text{Heat supplied}} \Rightarrow 0.5408$

$\Rightarrow \frac{\text{work done}}{1800}$

work done = 973.5 RJ

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5] $COP = 1.2$

Heat removed from refrigerator space

$Q_{room} = 60\ KJ/min$

a] Electric power consumed

$$COP(Ref) = \frac{Q_R}{W_{net}}$$

$$\Rightarrow 1.2 = \frac{60}{W_{net}}$$

$$W_{net} = \frac{60}{1.2} \Rightarrow 50\ KJ/min$$

$$= 0.833\ KJ/s$$

$$\Rightarrow 0.833\ KW$$

b] Rate of transfer to the kitchen air is

$$Q_{net} = Q_{add} - Q_{in}$$

$$50 = Q_{add} - 60$$

$$Q_{add} \Rightarrow 60 + 50$$

$$Q_{add} = 110\ KJ/min$$

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| Fast Cont

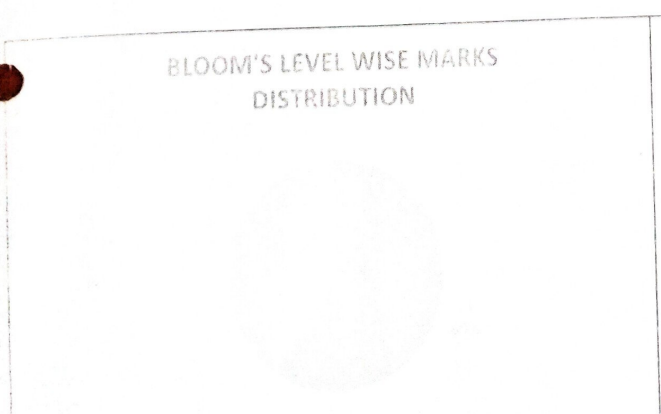
POORNIMA
COLLEGE OF ENGINEERING

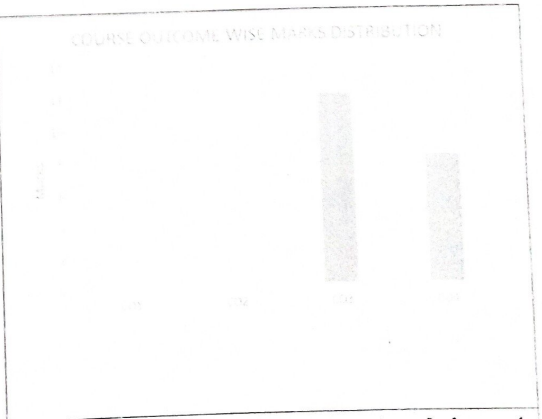
SESSION 2022-23
OBT

Campus: PCE Course: B.Tech. Class/Section: ..... Date: .....
Name of Faculty: Name of Subject: BME Code: 1FY3/2FY3-07
Date of Preparation:..... Scheduled Date of Submission: .....

	Question	Marks	CO	PO
Q.1	Explain the working of steam power plant with the suitable diagram.	4	CO3	PO1
Q.2	Explain with neat sketch the working of refrigeration system with industrial applications.	4	CO3	PO1
Q.3	Explain the working of working of Reciprocating and Centrifugal pumps with industrial application.	4	CO3	PO1
Q.4	An engine working on air standard Otto cycle has a cylinder diameter of 10 cm and stroke length of 15 cm. The ratio of specific heats for air is 1.4. If the clearance volume is 196.3 cc and the heat supplied per kg of air per cycle is 1800 kJ/kg, then work output per cycle per kg of air is.	4	CO4	PO2
Q.5	A house hold refrigerator with a C.O.P of 1.8 removes heat from a refrigerated space at a rate of 90 kJ/min. Determine: (1)The electrical power consumed (2) the heat rejected to surrounding.	4	CO4	PO2

BLOOM'S LEVEL WISE MARKS DISTRIBUTION	COURSE OUTCOME WISE MARKS DISTRIBUTION





BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analyzing, 5 – Evaluating, 6 - Creating)

CO – Course Outcomes; PO – Program Outcomes

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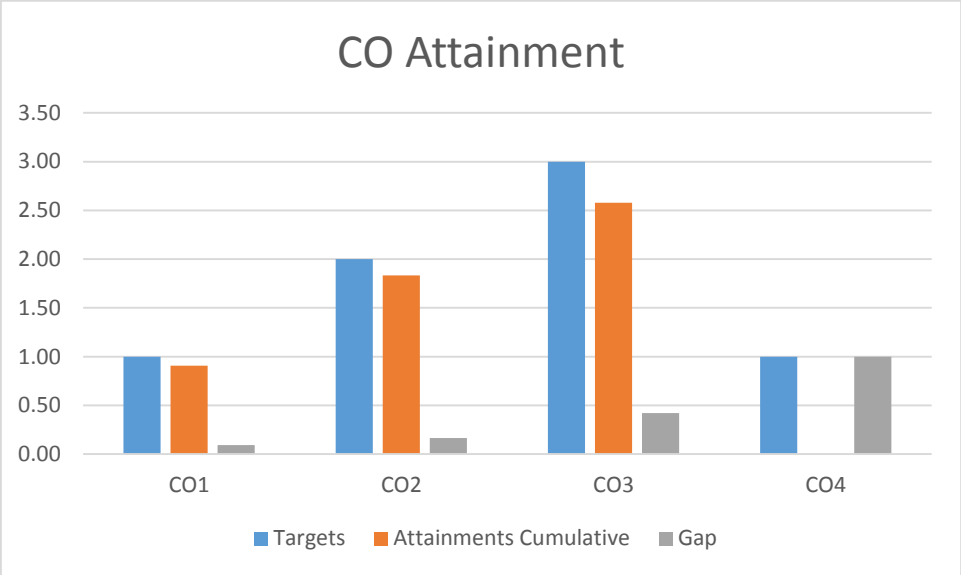
Section D (CSE), 2023-24

CO-Gap Identifications for Mid- 1:

CO Attainment					
Overall CO Attainments for PO	**CO1**	**CO2**	**CO3**	**CO4**	**CO**
Targets	**1.00**	**2.00**	**3.00**	**1.00**	**1.75**
Attainments	**0.91**	**1.83**	**2.58**	**0.00**	**1.59**
Gap	**0.09**	**0.17**	**0.42**	**1.00**	**0.15**



Gaps Identified for Mid- 1:

Describe what the reasons for gaps are:

- 5 Students were not able to give the proper explanation of problems related IC Engine. Due to this reason the values of CO3 is showing the more gap.
- 4 students were not able to give the proper reply of Basic definition correctly.

Activities Decided to bridge the gap after Mid-2:

- Notes were circulated to the students related to the IC engine and revised the important definition.

DETAILED LECTURE NOTES

Unit - 3 Refrigeration & A/C

Campus: ..... Course: ..... Class/Section: ..... Date: .....
Name of Faculty: ..... Name of Subject: ..... Code: .....

Refrigeration →

It is the science of providing and maintaining the temp^r below that of the surrounding atm.

Unit of Refrigeration →

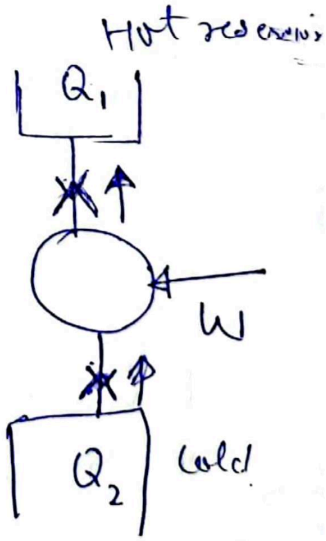
Unit of refrigeration is called "Ton of refrigeration"

The quantity of heat to be removed to produce one ton of ice at 0°C within 24 hrs when the initial condition of water is also at 0°C.

In SI unit → 1 Ton or 1 TR = 210 KJ/min or 3.5 KW

Performance of Refrigerator →

$$COP = Q_2/W$$



Refrigerants →

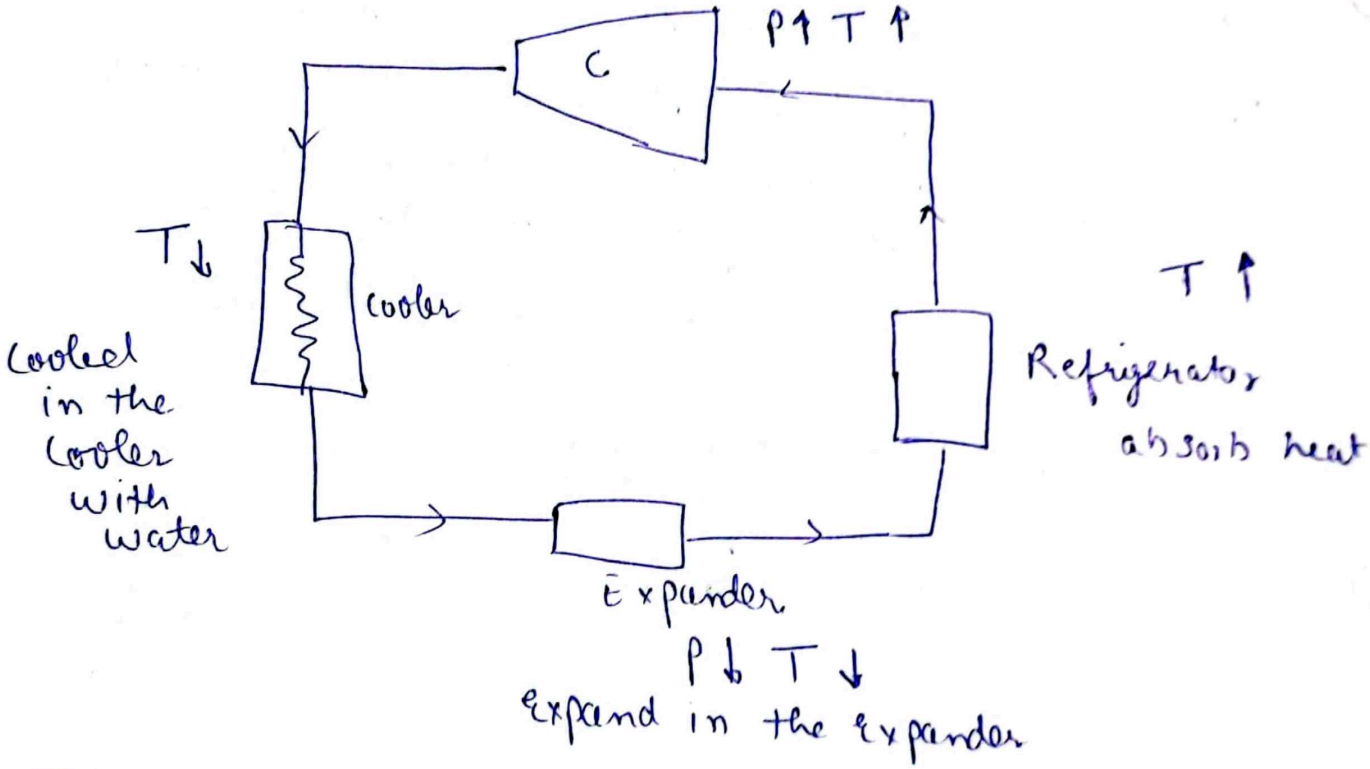
→ working fluid of refrigerator.

It is capable of absorbing heat at a lower temp^r & rejecting the heat at higher temp^r in form of latent heat or sensible heat.

Types of Refrigerants →

1. Freon-12 → Domestic Refrigerators, water cool,
2. Freon-22 → used in A/C
3. Ammonia → used in absorption systems.
4. CO_2, SO_2, CH_3Cl

Closed Air Refrigeration cycle →

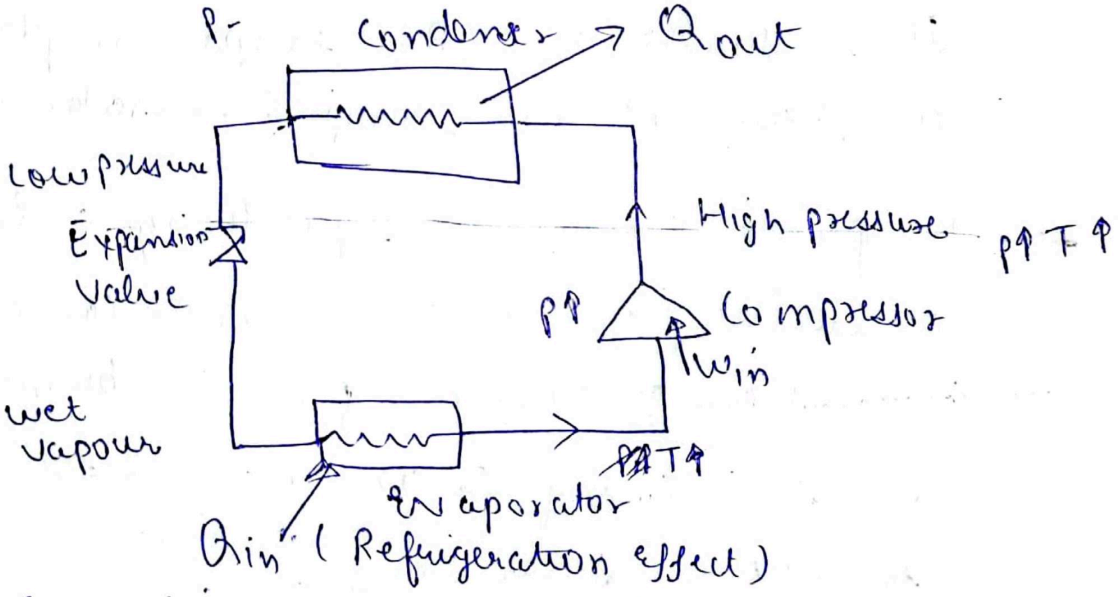


The warm air from the compressor is cooled in a cooler with water. The cold air from the cooler expands in expander causing big drop in pressure & temp. Cold air in the expander is passed to refrigerator where it absorb heat & make it cold. Then it return to compressor & the the cycle is repeated.

Method of Refrigeration →

1. VCRS (Compression)
2. VARS (Absorption)

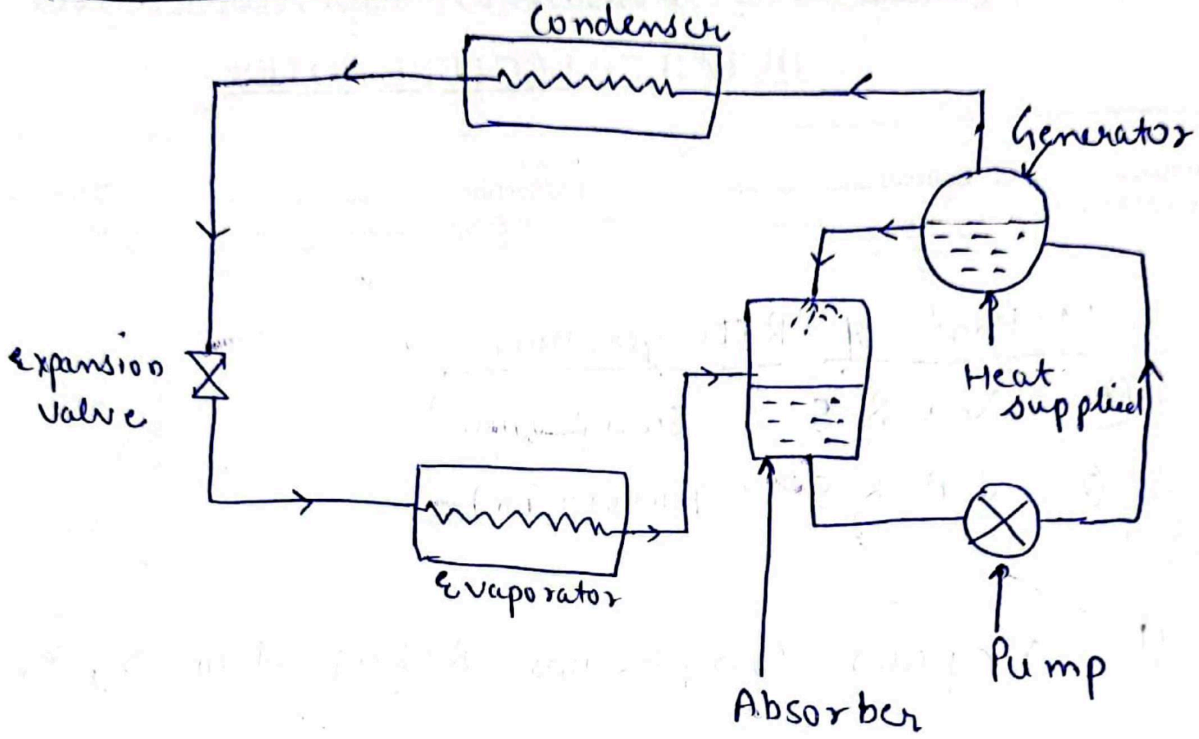
1. Vapour-Compression Refrigeration System →



→ Used for refrigerator, water cooler, air conditioner and cold ~~Storag~~ storage.

The refrigerant enters the evaporator as wet vapour & at lower temp & pressure. it absorb heat of vaporisation & cold. Then it enters the compressor to make vapor higher pressure & high temp & at superheated state.

(2) Vapour Absorption Refrigeration System →



→ It is similar to VCRS except in place of compressor, Absorber, pump & generator are used.

→ The pump consumes comparatively a lesser amount of electric power & the generator can be operated by heat energy obtained from the burning of any low cost fuel or any heat source including solar energy.

→ The refrigerant used are amonia.

→ It is larger in size on comparing with VCRS with lower COP, wear & tear and is having lesser maintance cost.

Application of Refrigeration →

1. In water coolers, to supply cold water
2. To manufacture ice
3. For preservation of Food, vegetable, milk
4. Preservation of poishables like mutton
5. Preservation of medicines, blood, tissues
6. Different types of industrial application
7. Preservation of dead bodies.

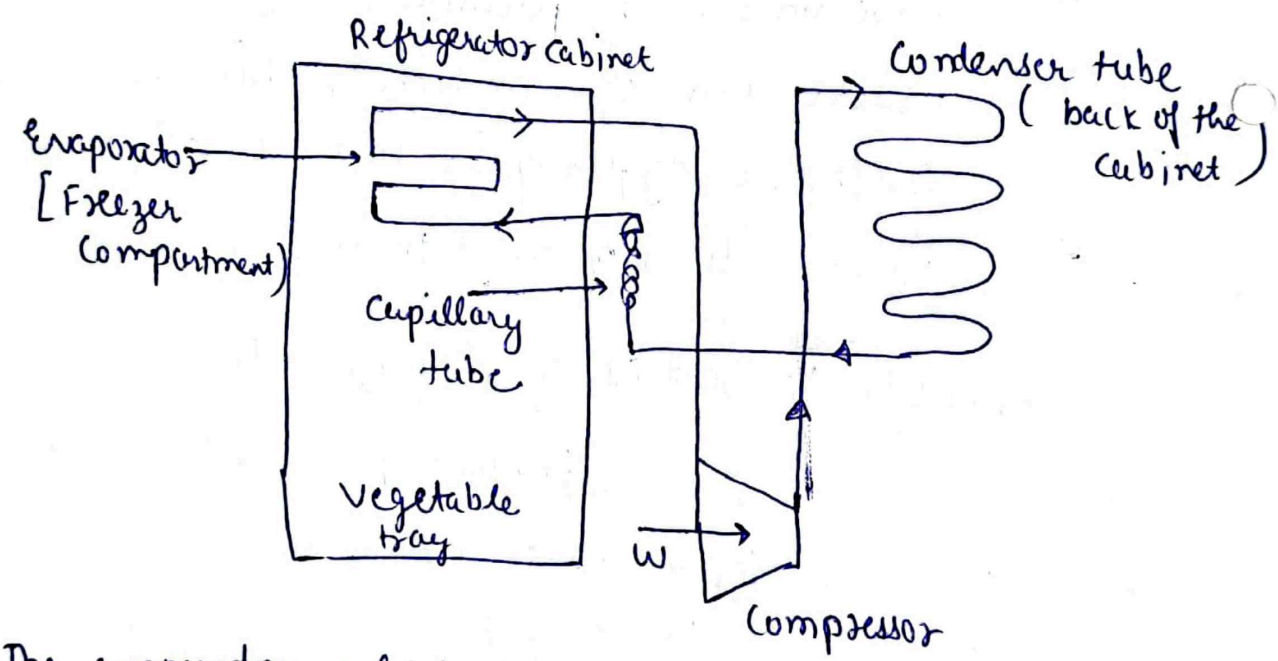
Desirable Properties of Refrigerants

1. low Boiling point, freezing point & high latent heat
2. low visosity & low specific heat
3. It should be easy to liquefy
4. Odourless and no hazardous effect on leakage
5. Chemical stability
6. Non-flammable
7. Low cost

Advantage of air refrigeration

1. Air is easily available & free of cost
2. Leakage of air will not create problem
3. Air is very safe, non-toxic & non-flammable
4. Maintance cost is low.

Domestic Refrigeration System



→ The evaporator which is coldest part is located on freezer compartment. A separate door is provided for the freezer where we can store ice or usually chiller tray is provided.

→ The condenser tubes are kept on the back of the refrigerator cabinet. The refrigerant vapour is condensed with the help of surrounding air which rises above by natural convection. ~~It is the no fruit~~.

The cold air made to flow into the freezer compartment by fan.

Air conditioning

AC involves controlling and maintaining the desired temp^r, humidity and direction of flow of air in a closed space.

Application

1. AC of houses, hotels, theatres etc.
2. Hospitals, operation threatres & intensive care units.
3. For comfort of passengers in car, buses, trains
4. A/c becomes very ~~assista~~ essential in many industries like textile, food.

Terminology

1. Dry air → Air without water vapour
2. Moist air → Mixture of dry air & moisture
3. Dry bulb temp^r → Actual temp^r measured by a standard-mercury thermometer
4. Wet bulb temp^r → Temp^r measured when bulb is covered by moistened cloth
5. Saturated air → mixture of dry air along with max^m possible water vapour at dry bulb temp^r.

Question of Unit - 3

Ques4 State the Term "One ton of refrigeration"

Ans It is defined as the amount of heat removed to produce 1 tone of ice at 0°c or within 24 hours. Initial condition of that liquid is also at 0°c.

Ques5 What do you mean by coefficient of performance (COP) of refrigerator?

Ans It is defined as the relationship between the power (KW) that is drawn out of the heat pump as cooling or heat and the power (KW) that is supplied to the compressor

$$C.O.P = \frac{Q_H}{W} = \frac{Q_H}{Q_H - Q_C} \Rightarrow \frac{T_H}{T_H - T_C}$$

Ques6 What are Air conditioning? Explain the comfort air conditioning.

Ans Air conditioning is that process used to create and maintain certain temperature

It provides cold air inside your home or enclosed space by actually removing heat and humidity from the indoor air.

Comfort Air conditioning :-

Comfort Air conditioning has the purpose of conditioning the air for human comfort.

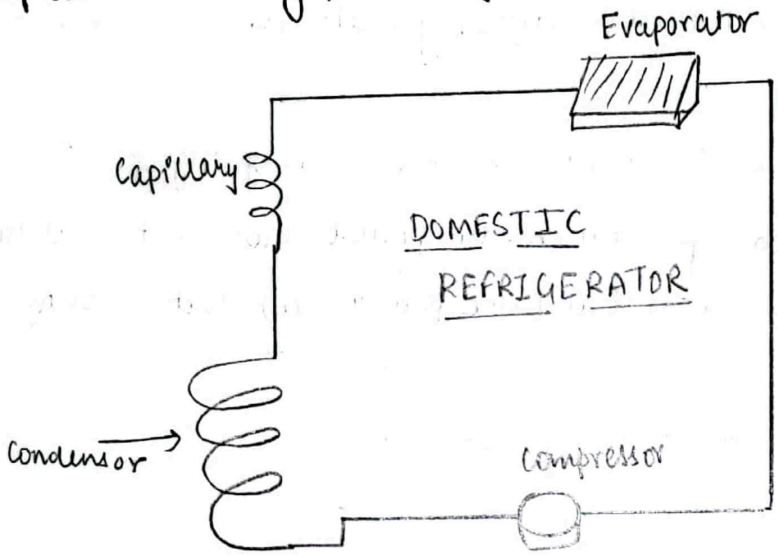
Aim: To provide artificial internal atmospheric conditions suitable to human effort and health. Parameters like temperature, humidity, air movement etc. are controlled as per requirements

→ In comfort Air conditioning, number of occupants are less but their stay time is more.

Applications :-

- Homes, Banks, Hospitals etc.
- Transportation : Trains, Airplanes, Buses
- Hotels, Restaurants, auditorium

Ques? Explain the working principle of domestic refrigerator with suitable sketch.



Working Principle :- Refrigerator work by causing the refrigerant circulating inside them to change from liquid into gas

Components working

(1) Compressor : The refrigerant is first passed through compressed and compressed at The high temperature and high pressure vapour of comp refrigerant emerges out of the compressor.

(2) Condensor : Condensor through natural circulation converts these high temperature and high pressure vapours into liquid form.

(3) Capillary Tubes : It is made up of coppere where this liquid loses its heat and is forced to cool down.

④ Evaporator :- This chilled liquid is passed through evaporator coiled through natural convection, it is turned into vapour phase
This is again passed through compressor and the cycle repeats

Ques 2 Explain the air conditioning in the refrigeration and air-condition system. Why is it important in the concern of human effort?

Ans 2 Air conditioning involves controlling and maintaining the desired temperature humidity and direction of flow of air in a closed sphere space.

Applications of Air conditioning

① Air conditioning of houses, hotels and theatres
② For comfort of passengers in cars, buses etc.
③ Air conditioning is very essential in many industries like textiles, food

→ It is an important concern because -
- Maintaining a suitable humidity in all parts of a building
- Being able to provide a constant and adequate supply of ventilation
- Removing microorganism, dust and other foreign bodies from air

Ques 4 Explain the working of four stroke diesel engine with diagram. 4

Ans It works on diesel cycle and consist of 4 stroke of crank shaft, to complete one cycle of operation

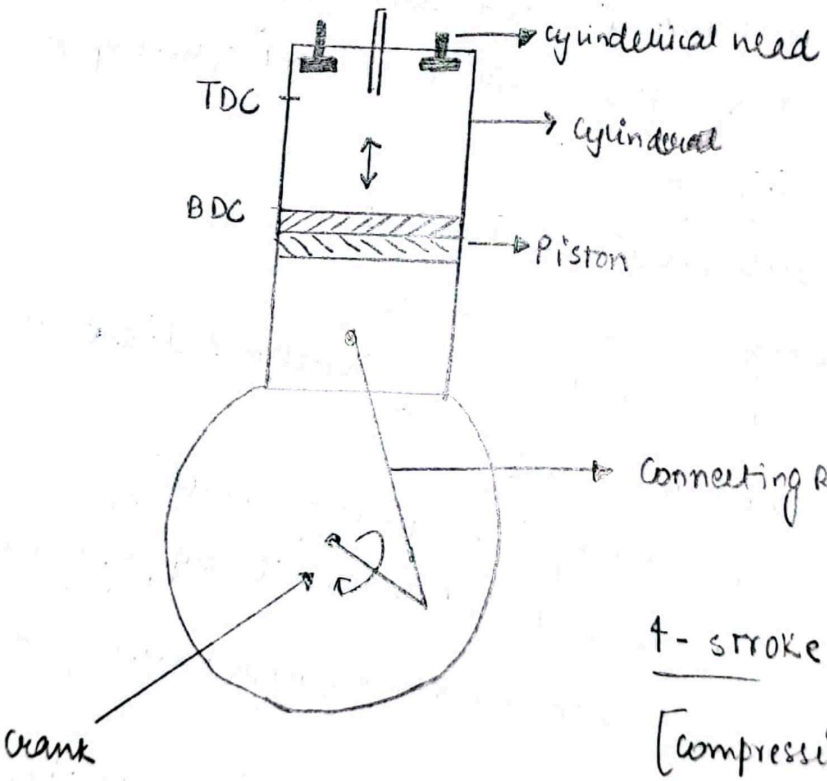
(i) Suction :- Inlet valve open
- exhaust valve closed
- piston TDC → BDC
- Air enter into cylinder

CamScanner

(ii) Compression stroke :- Piston move BDC to TDC. Also the compression take place. Both valves are closed. Just before the end of compression, diesel injected into compressed air by help of fuel injector.

(iii) Expansion stroke :- Fuel starts burning at constant pressure and expansion takes place. Piston moves from TDC to BDC.

(iv) Exhaust stroke :- Piston also moves from BDC to TDC. Exhaust valves are opened and burnt gases are drawn out. Inlet valves are closed and cycle repeats



4- stroke Diesel Engine

[Compression Ignition]

B.TECH. (I Semester) POORNIMA COLLEGE OF ENGINEERING, JAIPUR Roll No. 051...
I MID TERM EXAMINATION 2023-24
Code: 1FY3-07 Category: PCC Subject Name–BASIC MECHANICAL ENGINEERING (BME)
BRANCH-ALL BRANCH
SET A

Max. Time: 2 hrs. Course Credit: 02
NOTE:- Read the guidelines given with each part carefully. Max. Marks: 60

Course Outcomes (CO):
At the end of the course the student should be able to:
CO1: Students will be able to retrieve basic concepts of thermal and manufacturing process. (Recall/Remembering).
CO2: Students will able to compare different types of thermal and manufacturing processes and. (Understand)
CO3: Students will able to annotating about the functioning of turbine & pumps, IC engines, refrigeration system, modes of transmission of power, materials and primary manufacturing process. (Apply)
CO4: Student will be able to appraise the fundamental knowledge of thermal engineering, in addition to understanding of power transmission to solve the industrial and societal issues. (Examine)

	PART - A: (All questions are compulsory) Max. Marks (10)				
		Marks	CO	BL	PO
Q.1	Explain thermodynamic System briefly.	2	1	1	1
Q.2	Define the term Industrial Engineering.	2	1	1	1
Q.3	Explain the properties of steam.	2	1	1	1
Q.4	Explain the term relative humidity.	2	1	1	1
Q.5	Explain thermodynamic work.	2	1	1	1
	PART - B: (Attempt 4 questions out of 6) Max. Marks (20)				
Q.6	What are the difference between the Fire tube boiler and water tube boiler?	5	2	2	1
Q.7	Explain the term Refrigeration and refrigerant. Explain the term unit of refrigeration.	5	3	3	1
Q.8	Explain the working of Diesel power plant with suitable diagram.	5	3	3	1
Q.9	Elaborate various laws of thermodynamics.	5	3	3	1
Q.10	What are the difference between VARS and VCRS.	5	2	2	1
Q.11	Explain various boiler mountings.	5	3	3	1
	PART - C: (Attempt 3 questions out of 4) Max. Marks (30)				
Q.12	Explain the working of Babcock and wilcox boiler with the help of neat diagram.	10	3	3	1
Q.13	Explain working impulse turbine? Explain pressure compounding and velocity compounding of impulse turbine with neat sketch?	10	3	3	1
Q.14	Explain the working of steam power plant with the help of neat diagram.	10	3	3	1
Q.15	Draw a schematic layout of a VARS and explains it's working.	10	3	3	1

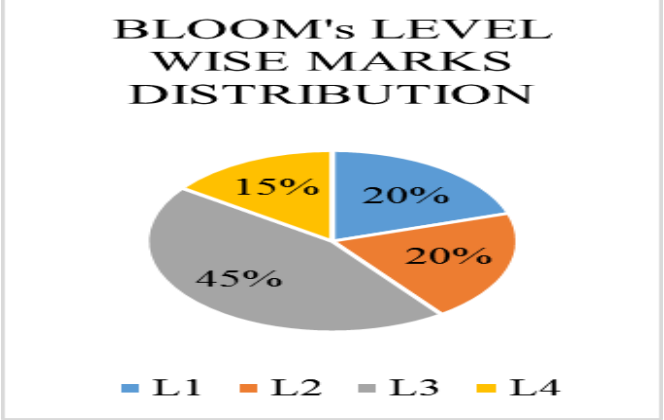
POORNIMA COLLEGE OF ENGINEERING

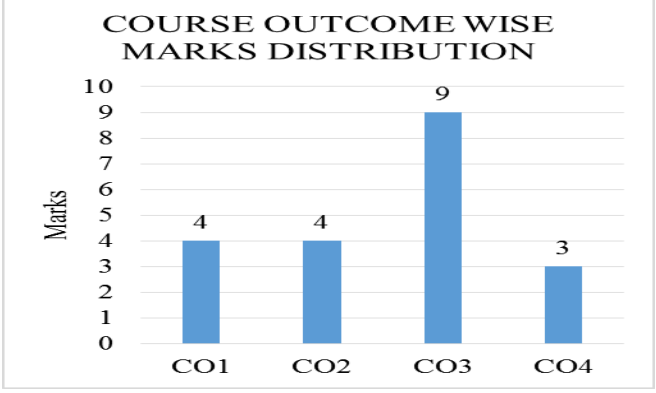
SESSION 2023-24

Assignment Sheet-2

Campus: PCE Course: B.Tech. Class/Section: ……. Date: …….
Name of Faculty: ……. Name of Subject: BME Code: 1FY3/2FY3-07
Date of Preparation:…….. Scheduled Date of Submission: …….

	Part A	Marks	CO	BL	PO
Q.1	Define 1 ton of refrigeration and what are the applications of refrigeration?	**1**	**CO1**	**L1**	**PO1**
Q.2	What is COP?	**1**	**CO1**	**L1**	**PO1**
Q.3	What is a priming?	**1**	**CO1**	**L1**	**PO1**
Q.4	Define refrigerant and what are the different types of refrigerants?	**1**	**CO1**	**L1**	**PO1**
Q.5	What are the classification and components of IC engine?	**2**	**CO3**	**L3**	**PO1**
	Part B				
Q.6	Write down the difference between reciprocating pump and centrifugal pump.	**2**	**CO2**	**L2**	**PO1**
Q.7	Write down the difference 2 stroke engine and 4 stroke engine?	**2**	**CO2**	**L2**	**PO1**
Q.8	Explain the working of Vapor compression refrigeration cycle with neat sketch.	**2**	**CO3**	**L3**	**PO1**
Q.9	With the help of neat diagram explain the layout of window AC.	**2**	**CO3**	**L3**	**PO1**
	Part C				
Q.10	With the help of neat diagram explain working and construction of 4 stroke SI engine and CI engine.	**3**	**CO3**	**L3**	**PO1**
Q.11	Calculate the ideal air standard cycle efficiency based on the Otto cycle in a petrol engine witha cylinder bore of 55mm, a stroke of 80mm, and a clearance volume of 23.3 cm3. Use the information form this compression ratio to calculate: Pressure and temperature at a beginning compression process is 101 kN/m2 and 870C. Temperature at the beginning of an expand process is1502°C? OR The refrigerating efficiency that is the ratio of actual COP to reversible COP of a refrigeration cycle is 0.8, the condenser and evaporator temperatures are 50°C and –30°C respectively. If cooling capacity of the plant is 2.4 kW then what is the work requirement?	**3**	**CO4**	**L4**	**PO2**



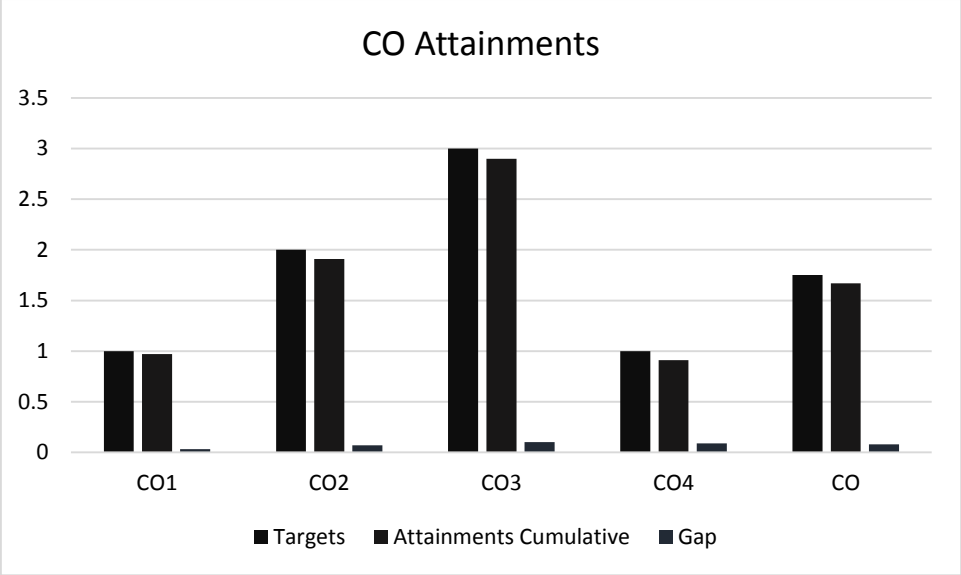


BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 –Analyzing, 5 – Evaluating, 6 - Creating) CO – Course Outcomes; PO – Program Outcomes

Section D (CSE), 2023-24

CO-Gap Identifications for Assignment 2:

CO Attainments					
Overall CO Attainments for PO	**CO1**	**CO2**	**CO3**	**CO4**	**CO**
Targets	**1**	**2**	**3**	**1**	**1.75**
Attainments Cumulative	**0.97**	**1.91**	**2.90**	**0.91**	**1.67**
Gap	**0.03**	**0.07**	**0.10**	**0.09**	**0.08**



Gaps Identified for Assignment 2:

Describe what the reasons for gaps are:

- No Gap

Activities Decided to bridge the gap:

- Notes were circulated to the students related to the gears and revised the important definition.

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DETAILED LECTURE NOTES

UNIT - 5

Campus:	Course:	Class/Section:	Date: .....
Name of Faculty:		Name of Subject:	Code: .....

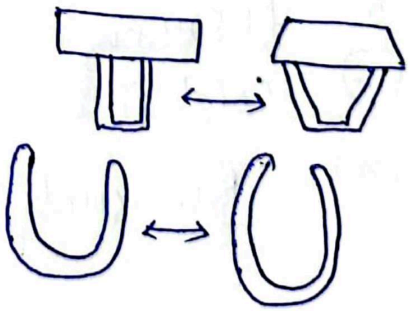
Metal Casting → It is a process involves the pouring of molten metal into a cavity or mould of the desired shape & allowing them to solidify.

Pattern → It is a model or replica of the object to be manufactured around which moulding sand is packed to get a mould of desired shape.

Pattern material → Wood, metal/alloy, Plastic, wax, Plaster.

Pattern Allowances :—

1. **Shrinkage allowance →** It is given to pattern to avoid change in dimension of casting because of the shrinkage of metal during solidification
2. Machining allowance
3. Draft allowance
4. Distortion or Camber allowance
5. Rapping allowance



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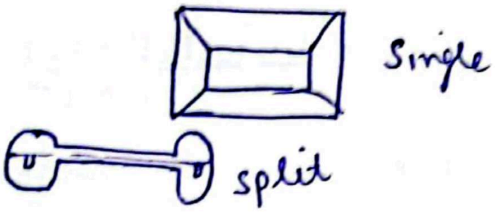
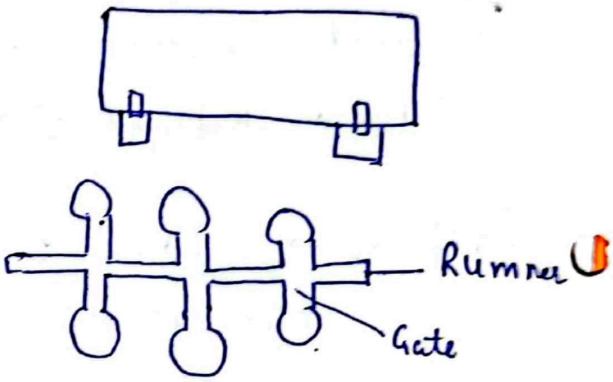
Types of Pattern

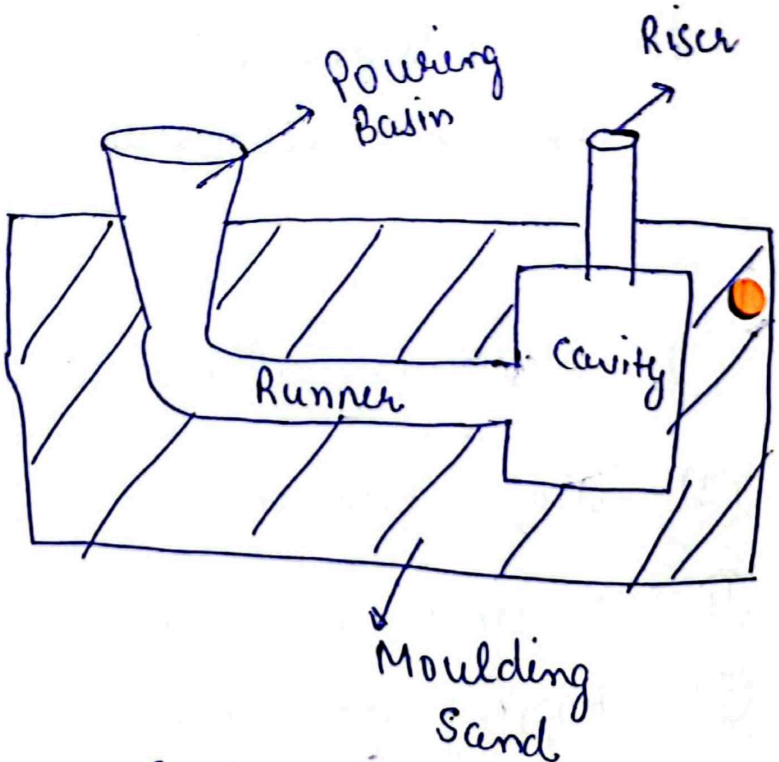
1. Solid pattern
2. Split pattern
3. Match plate patten
4. Loose Piece pattern
5. Skeleton Pattern
6. Sweep pattern
7. Gated pattern
8. Cope & Drag pattern





Casting defect →

1. Blow holes
2. Pin holes
3. Swell
4. Shrinkage Cavity
5. Shift
6. Misrun
7. Cold Shut
8. Runout.



Casting Process

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DETAILED LECTURE NOTES

Metal Forming Process →

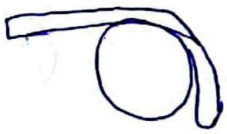
It is a process in which metal is plastically deform to get required shape & size.

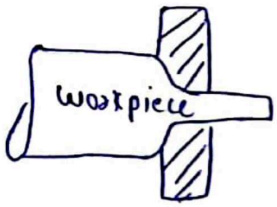
1. Hot working (above recrystalization temp^r)
2. Cold working (Below recrystallization temp^r)

Forging →

It is metal forming process in which the product of desired shape is obtained by pressing & hammering.

a. Drawing
b. Edging
c. Fullering
d. Bending
e. upsetting
f. Fordge welding





Hand Forging →

Required shape of workpiece is obtained manually.

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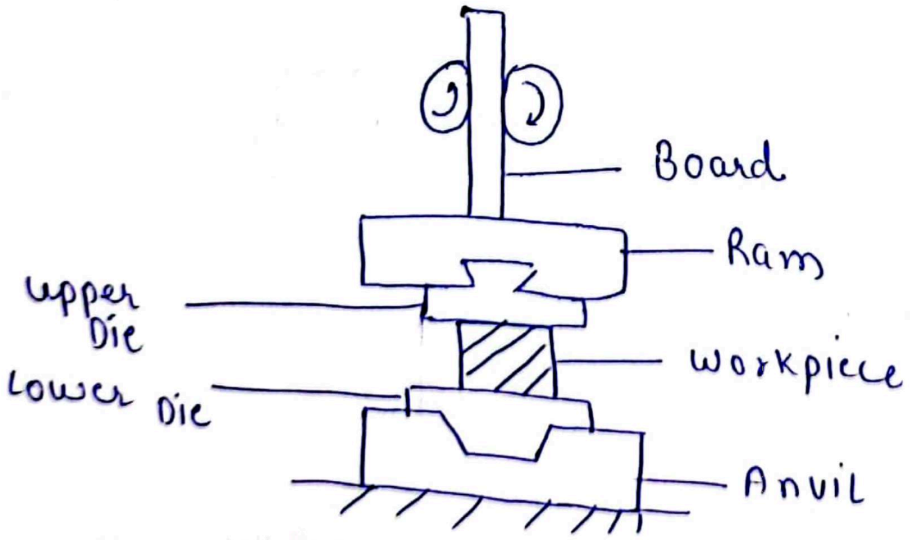
Power forging →

Forging is done with power hammers and tools.

Drop Forging → It is an operation in which product of desired shape is obtained by giving repeated blows to heated metal.

Press forging → It is obtained by continuous squeezing action of heated billet with hydraulic press and is similar to drop forging.



Forging operation

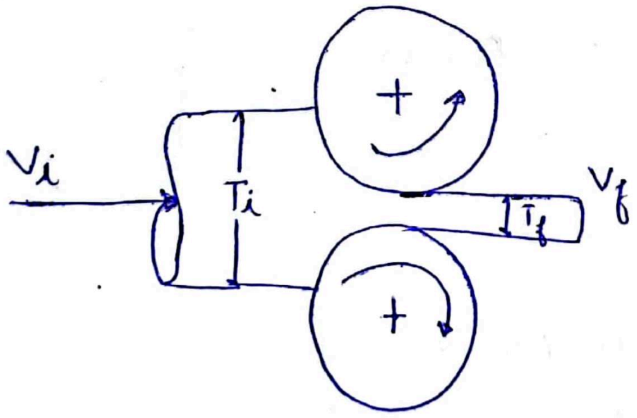
DETAILED LECTURE NOTES

Campus:	Course:	Class/Section:	Date: .....
Name of Faculty:		Name of Subject:	Code: .....

Rolling Process →

It is a metal forming process which is achieved by passing the metal b/w rotating rolls.

Rolling is most widely used manufacturing process because of its high productivity and low cost.



It can be hot / cold working operation. The feeding of metal b/w the rolls. once is called rolling operation.

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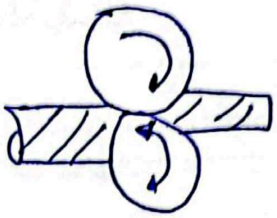
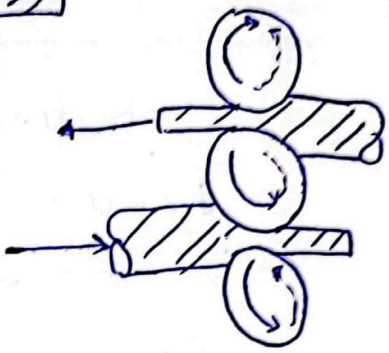
Classification of Rolling Mills →

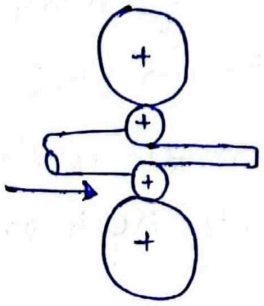
① 2-high roll mills



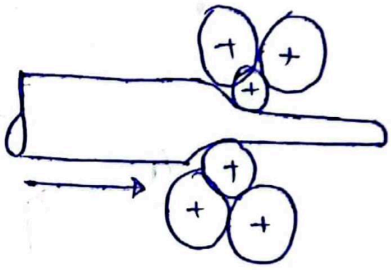
② 3-high roll mills



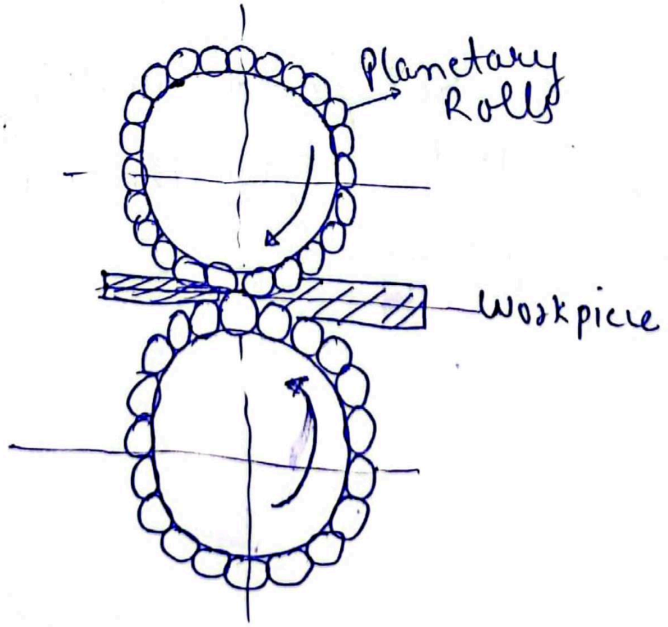
③ 4-high roll mills



④ Cluster Rolling mill



⑤ Planetary Rolling Mill →

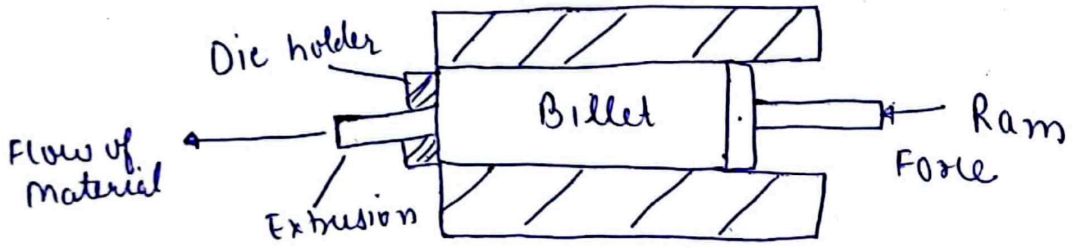


Extrusion →

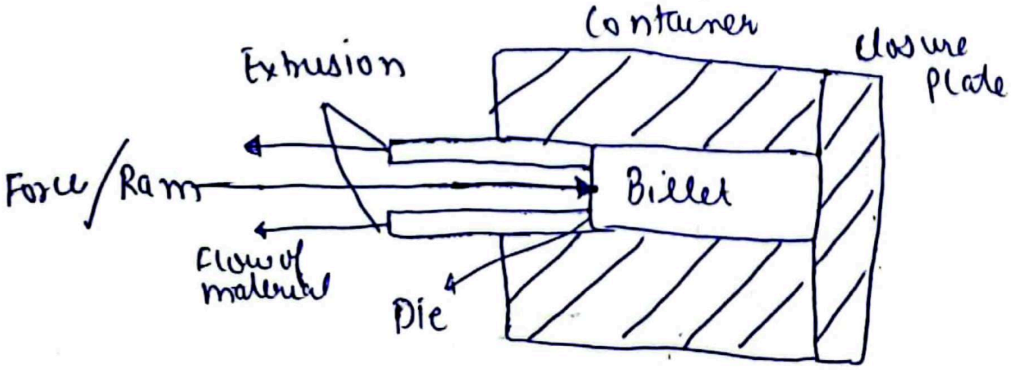
It is a metal forming process in which a block of metal is reduced to desired shape by confining it in a closed container and then forcing it to flow only through a die orifice under high pressure.

① Direct or Forward extrusion →

Flow of material & Direction of force is same.

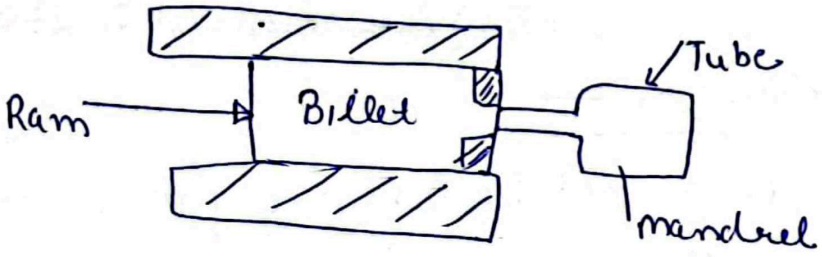


② Indirect or Backward Extrusion →



Flow of material and direction of Force applied is in opposite direction.

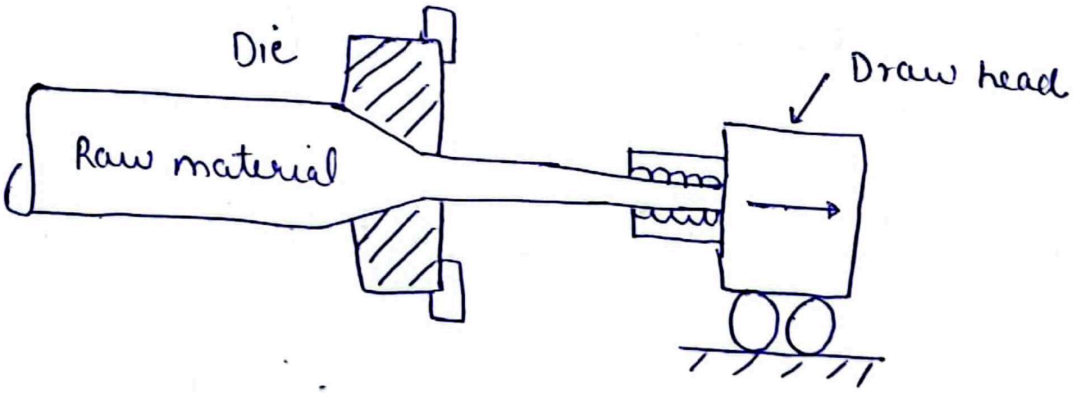
③ Tube Extrusion →

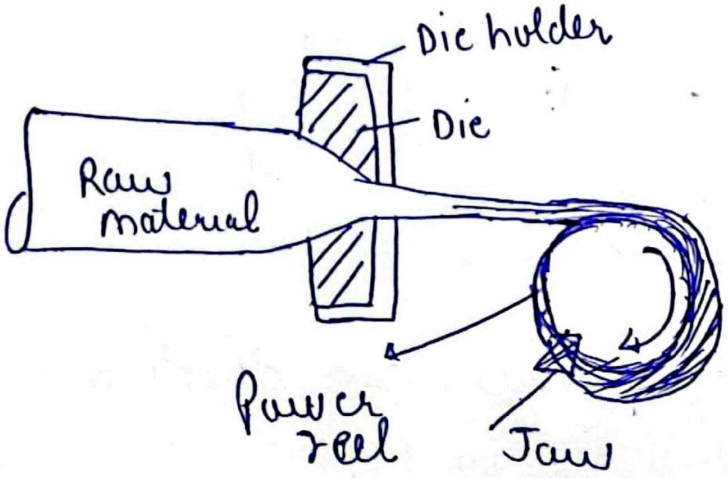


Drawing →

It is a metal forming process which involves pulling the metal through a die by appling some mechanical forces.

Rod/Wire drawing →





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DETAILED LECTURE NOTES

UNIT - 4

✱ Belt and Rope Drives ⇒

Belts and rope are used to transmit power or rotary motion from one shaft to another. These are useful when power is to be transmitted b/w shaft whose centre distance is large.

Belts and rope transmit power due to friction between them & the pulley.

↳ An open belt drive is shown in Fig 5.1. Here, Pulley A and B are mounted on two shafts. Pulley A is keyed to the rotating shaft (driver) and Pulley B is keyed to the shaft which is to be rotated (follower)

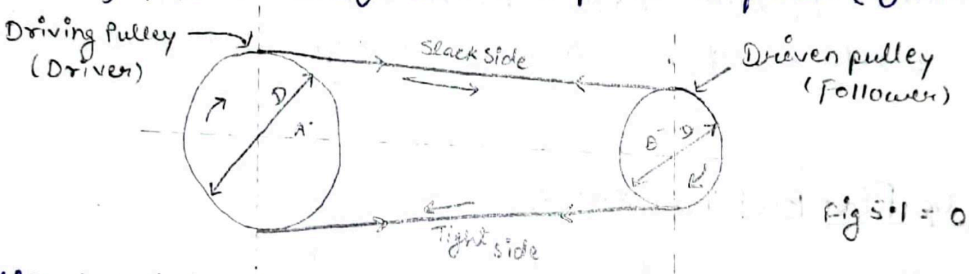


Fig 5.1 = Open Belt Drive

when pulley A rotates, the belt is carried by this pulley due to the grip b/w its surfaces and the belt. Now, the belt carries the driven pulley B which start rotating. The grip b/w the pulley and the belt is obtained by friction which arises from the pressure b/w the belt and the pulley. The speed of the driven shaft can be varied by the varying the diameter of the 2 pulleys.

4.2 Types Of Belts ⇒

A belt may be of rectangular section known as a flat belt or of trapezoidal section known as a V-Belt or of circular section known as a rope, as shown in Fig. 5.2 (a), (b) and (c) respectively.

→ Flat belts are used to transmit a moderate amount of power from one shaft to another, when the distance b/w the pulleys is not more than 15 m.

→ V-Belts are used to transmit a large amount of power from one shaft to another when the two pulley are very close to each other.

→ Rope are used to transmit a great amount of power when the distance b/w the shafts is large (more than 10m).

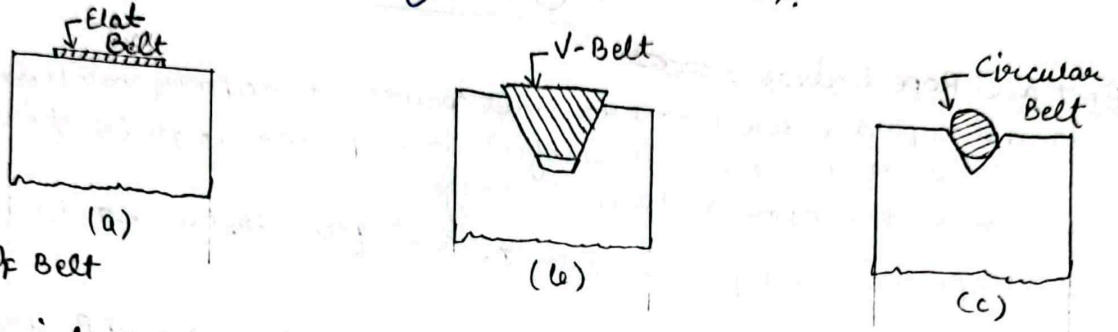


Fig 5.2 = Types of Belt

5.3 Materials =>

The material used for belts and ropes should be strong, flexible and durable. It must have a high cofficient of friction. Belt material generally used are leather, cotton and rubber.

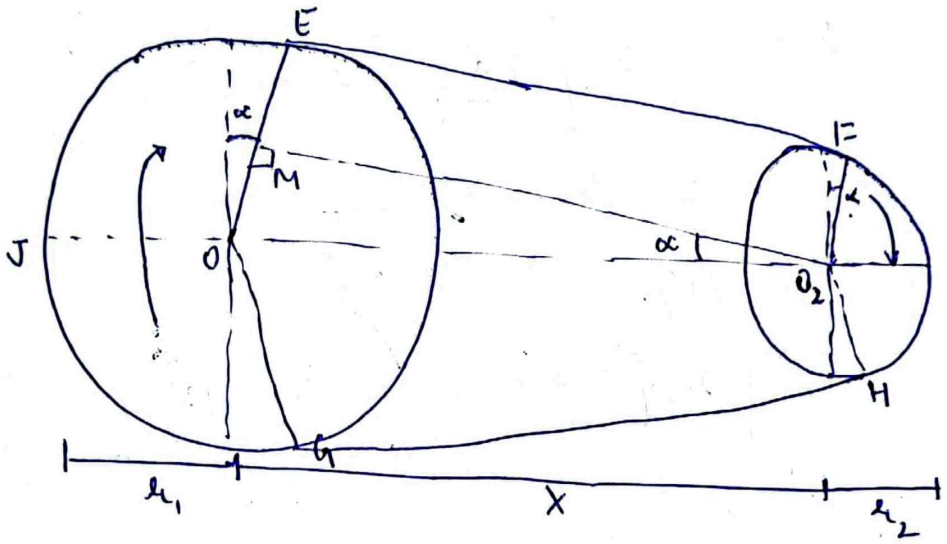
5.4 Types Of Flat Belt Drives =>

The following types of belt drives are available to transmit power from one shaft to another.

1. Open Belt Drive = An open belt drive is used when driven pulley (follower) is intended to be rotated in the same direction as the driving pulley (driver) as shown in 5.1 Figure.

In this case, shaft are arranged parallel and driver A pulls the belt from one side (lower side) and delivers it to the other side (upper side). Thus, the tension is more in the lower side of the belt than that in the upper side. The lower side belt is known as tight side (because of more tension) and the upper side belt is known as slack side (because of less tension) as shown in Fig 5.1.

Open belt Drive →



r_1 = Radii of larger pulley
r_2 = " " smaller "
L = length of belt

Let angle MO_2O_1 = α radian

$$L = \text{Arc } GJE + \text{Arc } FKH + HG$$

$$= 2\left[\text{Arc } JE + \text{Arc } FK + EF\right]$$

$$\sin\alpha = \frac{O_1M}{O_1O_2} = \frac{r_1 - r_2}{x}$$

Since $\sin\alpha$ is very small

$$\sin\alpha = \alpha = \frac{r_1 - r_2}{x}$$

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$$\text{Arc } JE = r_1\left[\frac{\pi}{2} + \alpha\right] \quad -(1)$$

$$\text{Arc } FE = r_2\left[\frac{\pi}{2} - \alpha\right] \quad -(2)$$

$$EF = MO_2 = \sqrt{(O_1O_2)^2 - (O_1M)^2}$$

$$= \sqrt{x^2 - (r_1 - r_2)^2}$$

$$EF = x\left[1 - \frac{1}{2}\left[\frac{r_1 - r_2}{x}\right]^2 + \cdots\right]$$

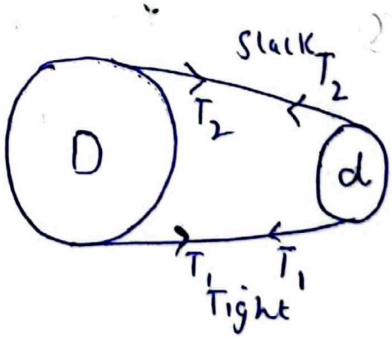
$$= x - \frac{(r_1 - r_2)^2}{2x} \quad -(3)$$

From (1) (2) & (3)

$$L = 2\left[r_1\left[\frac{\pi}{2} + \alpha\right] + x - \frac{(r_1 - r_2)^2}{2x} + r_2\left[\frac{\pi}{2} - \alpha\right]\right]$$

$$\boxed{L = \frac{\pi}{2}\left[d_1 + d_2\right] + 2x + \frac{[d_1 - d_2]^2}{4x}}$$

Power Transmitted by a Belt →



T_1 & T_2 tension on tight & slack side

V = velocity of Belt

$$W = (T_1 - T_2)\,V \quad N\text{-}m/s$$

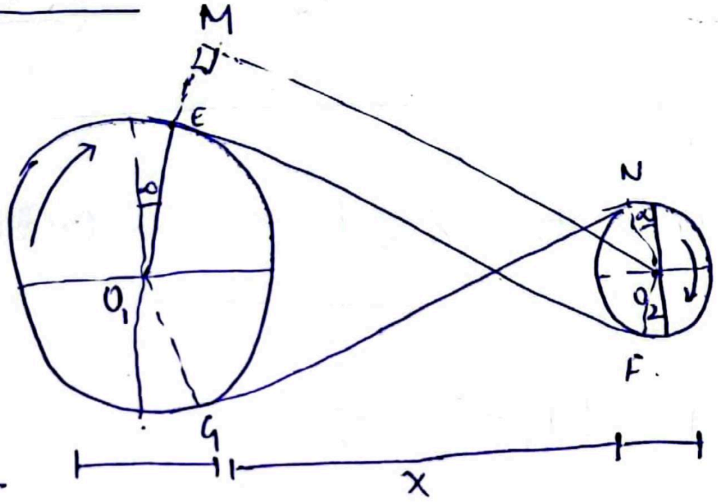
$$P = (T_1 - T_2)\,V \quad W$$

$$T_D = (T_1 - T_2)\,r_1$$

$$T_P = (T_1 - T_2)\,r_2$$

Cross Belt drive →

r_1 & r_2 → radii of larger & smaller pulley



$$\sin\alpha = \frac{r_1 + r_2}{x}$$

$$L = \text{Arc } GJE + EF + \text{Arc } FKH + HG$$

$$L = 2\left[\text{Arc } JE + FE + \text{Arc } FK\right)$$

$$\text{Arc } JE = r_1\left[\frac{\pi}{2} + \alpha\right] \quad -(1)$$

$$\text{Arc } FK = r_2\left[\frac{\pi}{2} + \alpha\right] \quad -(2)$$

$$EF = \sqrt{\left[(O_1O_2)^2 - (O_1M)^2\right.}$$

$$= \sqrt{x^2 - (r_1 + r_2)^2}$$

$$= x\left[1 - \frac{1}{2}\left[\frac{r_1 + r_2}{x}\right)^2 + \dots\right]$$

$$EF = x - \left[\frac{(r_1 + r_2)^2}{2x}\right] \quad -(3)$$

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From (1) (2) & (3)

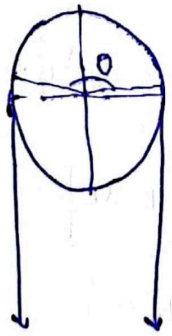
$$L = 2\left[r_1\left(\frac{\Delta}{2} + \theta\right) + x - \left[\frac{(r_1 + r_2)^2}{2x}\right] + r_2\left[\frac{\Delta}{2} + \theta\right]\right]$$

$$\boxed{L = \pi[r_1 + r_2] + 2x + \left[\frac{(r_1 + r_2)^2}{2x}\right]}$$

Power transmitted in Cross Belt drive

$$P = (T_1 - T_2)\, v$$

Ratio of Driving Tensions



if $T_1 > T_2$

T_1 = Tension in belt on tight side

T_2 = Tension in belt on slack side

θ = Angle of contact

$$\boxed{\frac{T_1}{T_2} = e^{\mu\theta}}$$

~~2,4,5,8,10~~ ;ĕ

DETAILED LECTURE NOTES

~~Assignment~~

1. What is slip.

When the frictional grip becomes insufficient. They may cause some forward motion of the driver without carrying the belt with it. They may also cause some forward motion of the belt without carrying the driven pulley with it. This is called slip of the belt and is generally expressed as percentage.

2. Why gear drives are known as positive power transmission drive?

→ Centre distances are relatively short
→ Speed of the shaft is low and the use of belt drive is not recommended.
→ Postive drive is neccessary
→ High torque transmitted.

3. Difference b/w slip & Creep.

Slip	Creep
① Slip is due to insufficient frictional grip b/w the belt and pulley.	① Creep is due to the elastic property of the belt.
② Slip reduces the velocity of the belt drive system.	② Creep also reduces the velocity of the belt drive system.

9. Two pulley, one 450mm ..... and pulley is 0.25?

Given $d_1 = 450\,mm = 0.45\,m$ or $r_1 = 0.225\,m$

$d_2 = 200\,mm = 0.2\,m$ or $r_2 = 0.1\,m$

$x = 1.95\,m$, $N_1 = 200\,rpm$, $T_1 = 1\,kN = 1000\,N$, $\mu = 0.25$

We known that speed of belt,

$$v = \frac{\pi d_1 N_1}{60} \Rightarrow \frac{\pi \times 0.45 \times 200}{60} \Rightarrow 4.714\,m/s$$

Length of Belt ↓

we know that length of crossed belt

$$L = \pi (r_1 + r_2) + 2x + \frac{(r_1 + r_2)^2}{x}$$

$$L = \pi (0.225 + 0.1) + (2 \times 1.95) + \frac{(0.225 + 0.1)^2}{1.95}$$

$$L = 4.975\,m$$

Angle of contact b/w the belt and each pulley

Let θ = Angle of contact b/w the belt & each pulley

We know that for a crossed belt drive,

$$\sin\alpha = \frac{(r_1 + r_2)}{x} \Rightarrow \frac{(0.225 + 0.1)}{1.95} \Rightarrow 0.1667$$

$$\alpha = 9.6^\circ$$

$$\theta = 180^\circ + 2\alpha \Rightarrow 180^\circ + 2 \times 9.6 \Rightarrow 199.2^\circ$$

$$\Rightarrow 199.2 \times \frac{\pi}{180} \Rightarrow 3.477\ radians$$

So, Power Transmitted,

Let T_2 = Tension in the slack side of belt.

we know $\Rightarrow \log \frac{T_1}{T_2} = \mu\theta$

$$= 0.25 \times 3.477 = 0.8692$$

$$\log \frac{T_1}{T_2} = \frac{0.8692}{2.3} = 0.378 \Rightarrow \frac{T_1}{T_2} = 2.387\ldots \text{ (Taking antilog of 0.378)}$$

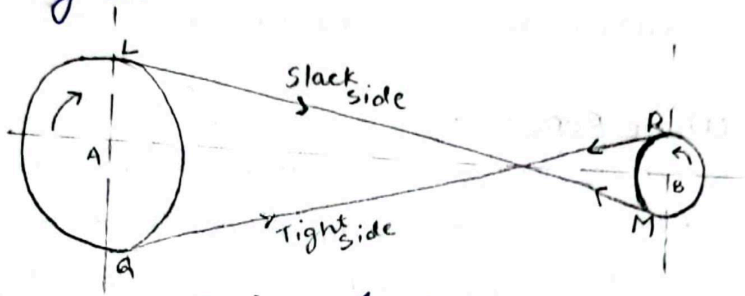
$$T_2 = T_1 / 2.387 \Rightarrow \frac{1000}{2.387} \Rightarrow 419\,N$$

So=Power Transmitted

$$P = (T_1 - T_2)v \Rightarrow (1000 - 419)\,4.714$$

$$\Rightarrow 2740\,W = 2.74\,kW$$ Ans.

2. Crossed Belt Drive = A cross belt drive is used when the driven pulley (B) is to be rotated in the opposite direction of the driving pulley (A) as shown in Fig. 5.3.



Figs.3 = Crossed Belt Drive

Stepped or ~~Cone~~ Cone pulley Drive = In this case, the driving shaft rotates at a constant speed. The speed of the driven shaft can be changed by shifting the belt from one step to another.

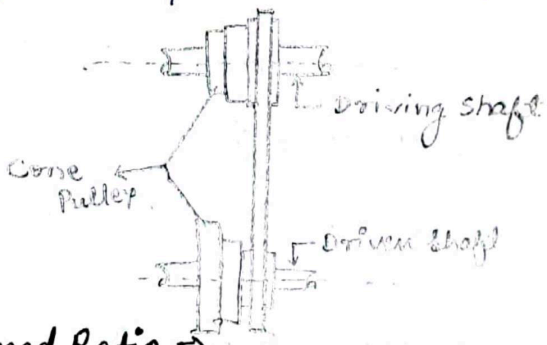


Fig 5.4 = Cone pulley drive

5.5 Velocity Ratio or Speed Ratio ⇒

It is the ratio b/w the speed of the driven pulley (follower) and the speed of the driven pulley (driver). Velocity ratio may be expressed, mathematically as given below.

$$\frac{\text{Speed of the Follower } (N_2)}{\text{Speed of the driver } (N_1)} = \frac{\text{Diameter of Driver } (D)}{\text{Diameter of follower } (d)}$$

5.6 Rope Drives ⇒

The rope drives are widely used to transmit large amount of power from one pulley to another, over a long distances. Ropes are made of cotton, hemp, manila or steel wire.

The frictional grip in the case of rope drive is more than ie belt drive. One of the main advantages of rope drive is hat a no. of drives can be taken from one driving pulley.

For Example In many spinning mills, the line shaft on each floor s driven by ropes passing directly from the main engine pulley on the ground floor. For a rope drive, the groove angle of the pulley is normally 45°, as shown in Fig. 5.2.(c).

5.6.1 Steel Wire Rope ⇒

This is used to transmit larger power over longer distances, compared to cotton rope or hemp rope. Wire ropes are used for cranes, elevators etc., unlike fibre ropes which are wedged b/w the side of the grooves, steel ropes rest at the bottom of the grooves in the pulley.

→ Following are the advantages of wire ropes.

① It can withstand heavy load and shock load.

② It can also withstand fatigue.

③ It is more durable ④ Highly reliable.

5.7 Differences between Rope & Belt Drive ⇒

Rope Drive – ① More suitable for long center distances b/w the shafts (more than 15m).

② Frictional grip is more.

③ Occurence of slip is not possible.

④ More power is transmitted.

⑤ No. of separate drive may be taken from one driven pulley.

⑥ Operating speed is less than 3m/sec

Belt Drive – ① Suitable for shorter center distances (not more than 15m).

② Frictional grip is less.

③ Occurance of slip is possible

④ Moderate power is transmitted

⑤ It is not possible to take no. of separate drives from one driving pulley.

⑥ Operating speed is upto 24m/sec.

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Q.8 Difference b/w V-Belt & Flat-Belt ⇒

V-Belt - ① Suitable for shorter center distances between the shafts.
② Trapezoidal section.
③ Frictional grip is more.
④ Since more than one belt can be used, power transmitted will be more.
⑤ Velocity ratio is high.
⑥ Occurence of slip is seldom possible.

Flat-Belt - ① Suitable for comparatively longer center distances.
② Rectangular section.
③ Frictional grip is less.
④ Since single belt can be used power transmitted is less.
⑤ Velocity ratio is low
⑥ Slip occur easily.

Q.9. Gears ⇒

A gear is a toothed wheel attached to a rotating shaft. There are many types of gears like spur gear, helical gear, bevel gear etc. as given in Fig. 5.5.

Spur Gears = This is the simplest type of gear. It has teeth parallel to the axis of rotation and is used to transmit rotation from one shaft to another parallel shaft.

Helical Gear = This gear has its teeth inclined to the axis of rotation. Helical gear are also used for the some application as spur gears. One major advantages of helical gears is its silent operations. The noise level is much less. In addition, helical gears have the ability to transmit heavy load at high speed.

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The ... and grip in the ... the

Bevel Gears = These gear have their teeth formed on conical surfa... and are used for transmitting motion b/w two shafts at 90°.

Fig 5.5 => Types of Gears. (Not Drawn)

→ Application of Gears =>

① To increase or decrease the speed of rotation.
② To reverse the direction of rotation.
③ To change the axis of rotation.

5.10 Gear Trains =>

Gear constitute one of the mode of transmission of power from one shaft to another. However, these are used when the distance between the driving and driven shafts is relatively small. A gear train can be defined as a mechanism which transmit power or motion from one shaft to another, with the help of gear wheels.

5.10.1 Types Of Gear Trains => (2 types)

① Simple Gear Train - In a simple gear train, each shaft between the driver and the follower carries only one gear as shown as Fig. 5.5.

In Fig. 5.5(a), gear 1 drives gear 2. Gear 1 is called driver and gear 2 is called driven or follower. It may be noted that the motion of the driven gear is an opposite direction to the motion of the driving gear. It may also be noted that when one more intermediate gear is added, the rotation of the driver and the follower will be in the same direction as shown in Fig 5.5(b).

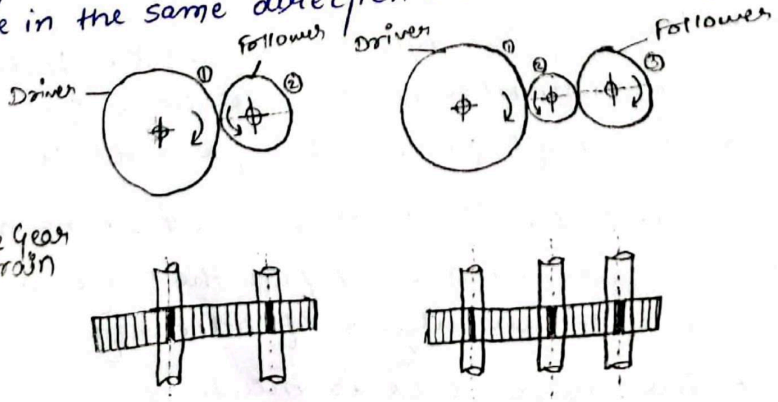

Fig 5.5 = Simple Gear Train

Speed ratio of a gear train = It is the ratio b/w the speed of the driver and the speed of the follower. Speed ratio may be expressed mathematically as given below.

$$\frac{\text{Speed of driver } (N_1)}{\text{Speed of Follower } (N_2)} = \frac{\text{No. of teeth on driver } (T_1)}{\text{No. of teeth on follower } (T_2)}$$

In a simple gear train, the speed ratio is independent of the intermediate wheels. These intermediate wheels are also called idle wheels, as they do not effect speed ratio of the system.

② Compound Gear Train – In a compound gear train, each intermediate gear shaft carries two gears which are fastened together rigidly. Such gears are termed as compound gears. Figure 5.6 represents a compound gear train comprising gears 1, 2, 3, 4, 5 and 6.

In Fig. 5.6 gear 1 is the driving gear mounted on shaft A, gears 2, 3, 4 and 5 are compound gears which are mounted on the shaft B and C and gear 6 is the driven gear (follower) mounted on shaft D. Compared to simple gear trains, the main advantages of compound gear train is that it can provide a larger velocity ratio in a limited space.

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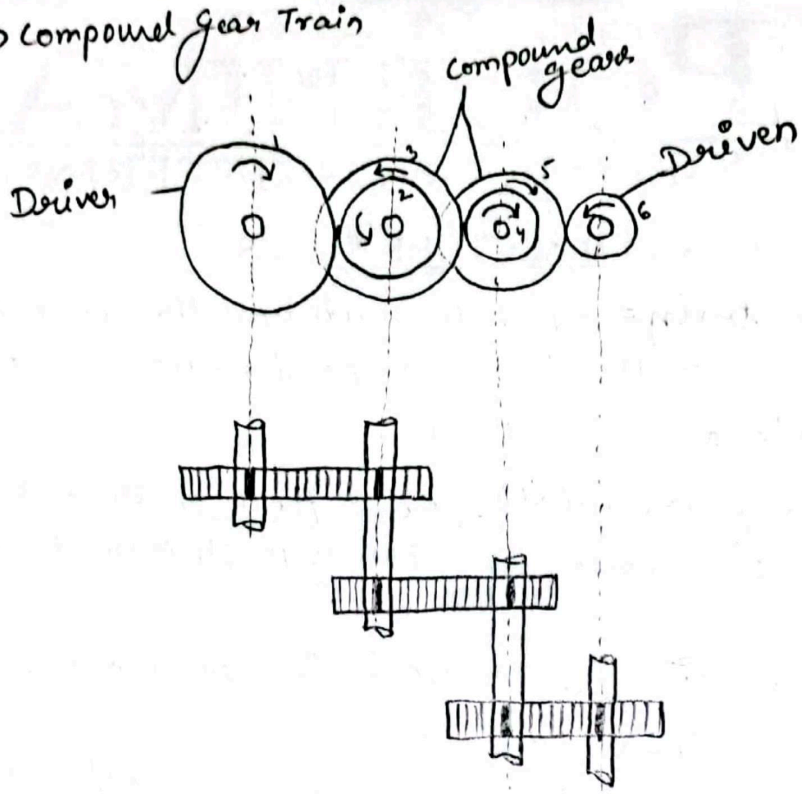
Fig 5.6 => Compound Gear Train



Speed ratio of a compared gear train = It is expressed mathematically as given below.

$$\frac{\text{Speed of First driver } (N_1)}{\text{Speed of the last follower}} = \frac{\text{Product of the No. of teeth on followers}}{\text{Product of the number of teeth on the drivers.}}$$

$$\frac{N_1}{N_6} = \frac{T_2 \times T_4 \times T_6}{T_1 \times T_3 \times T_5}$$

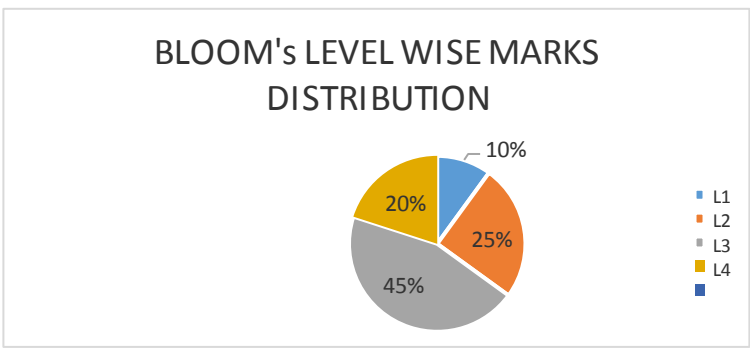
POORNIMA COLLEGE OF ENGINEERING

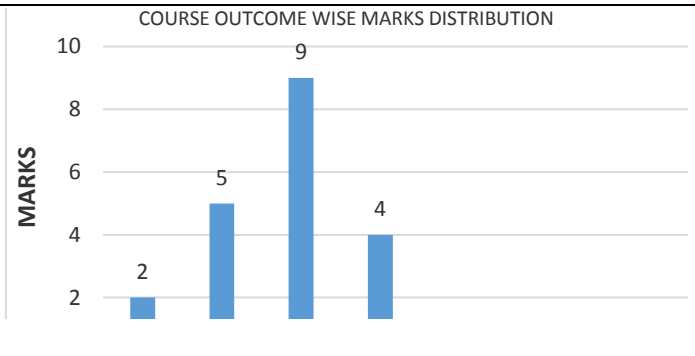
SESSION 2023-24

Assignment Sheet-2

Campus: PCE Course: B.Tech. Class/Section: ……. Date: …….
Name of Faculty: ……. Name of Subject: BME Code: 1FY3/2FY3-07
Date of Preparation:…….. Scheduled Date of Submission: …….

		Marks	CO	BL	PO
Q.1	Explain the open belt and cross belt drives	1	CO1	L1	PO1
Q.2	List the methods to reduce the slip in belt and pulley	1	CO1	L1	PO1
Q.3	Explain ratio of friction tensions, centrifugal tension in a belt	1	CO2	L2	PO1
Q.4	What is Gear? Explain different types of gear for transmission of power with suitable diagram	2	CO3	L1	PO1
Q.5	Derive an expression for the length of open belt derives.	3	CO3	L3	PO1
Q.6	State the types of chains & sprockets.	2	CO2	L2	PO1
Q.7	What are the advantages of 'V' belt drive over flat belt drive ?.	2	CO2	L2	PO1
Q.8	Classify different types of power transmission system.	2	CO3	L3	PO1
Q.9	A belt is running over a pulley of diameter 100 cm at 300 rpm. The angle of contact is 150o and coefficient of friction between the belt and the pulley is 0.3. If the maximum tension in the belt is 3000N, find the power transmitted by the belt	4	CO4	L4	PO2
Q. 10	Explain power transmitted by belts and ropes	2	CO3	L1	PO1





BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analyzing, 5 – Evaluating, 6 - Creating)

CO – Course Outcomes; PO – Program Outcomes

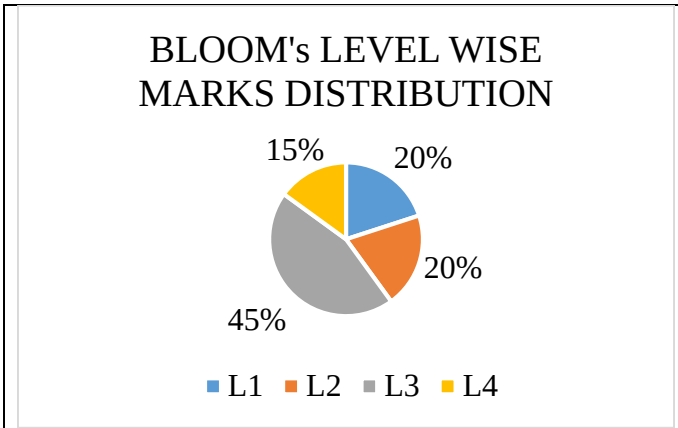
POORNIMA COLLEGE OF ENGINEERING

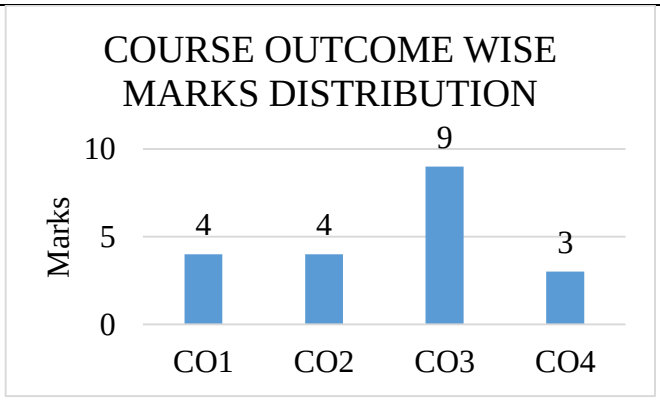
SESSION 2023-24

Assignment Sheet-3

Campus: PCE Course: B.Tech. Class/Section: ……. Date: …….
Name of Faculty: ……. Name of Subject: BME Code: 1FY3/2FY3-07
Date of Preparation:…….. Scheduled Date of Submission: …….

	Part A	Marks	CO	BL	PO
Q.1	Define Slip.	1	CO1	L1	PO1
Q.2	What is Annealing, tempering and normalizing?	1	CO1	L1	PO1
Q.3	What is a manufacturing technology?	1	CO1	L1	PO1
Q.4	Enumerate some common casting defects and explain the reasons which cause these defects.	1	CO1	L1	PO1
Q.5	Explain forging and rolling process.	2	CO3	L3	PO1
	Part B				
Q.6	Write down the difference between 'V' belt drive over flat belt drive.	2	CO2	L2	PO1
Q.7	Differentiate between brazing and soldering. And also write difference between arc welding and gas welding?	2	CO2	L2	PO1
Q.8	What is Gear? Explain different types of gear for transmission of power with suitable diagram	2	CO3	L3	PO1
Q.9	Classify the Engineering materials and explain the application and constituents of some of the important ferrous and non-ferrous materials.	2	CO3	L3	PO1
	Part C				
Q.10	Derive an expression for the length of open belt derives.	3	CO3	L3	PO1
Q.11	A belt is running over a pulley of diameter 100 cm at 300 rpm. The angle of contact is 150o and coefficient of friction between the belt and the pulley is 0.3. If the maximum tension in the belt is 3000N, find the power transmitted by the belt	3	CO4	L4	PO2





BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 –Analyzing, 5 – Evaluating, 6 - Creating) CO – Course Outcomes; PO – Program Outcomes

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DETAILED LECTURE NOTES 1.

Assignment - 02

Q1. What is slip?

Ans The difference between the speed of pulley and belt. The relative motion bet^n pulley and belt is known as slip.
Due to insufficient grip of friction bet^n pulley and belt there are some relative motion in bet^n those two is present. This motion is called Slip of belt.

Q2. Explain the velocity ratio of belt drive with the consideration of slip.

Ans Velocity ratio of belt drive is defined as the ratio bet^n the speed of the driven pulley (follower) and the speed of driving pulley (driver). It is expressed mathematically as :-

$$\frac{\text{Speed of follower}}{\text{Speed of driver}} = \frac{\text{Diameter of driver}}{\text{Diameter of follower}}$$

Q3. Why gear drives are known as positive power transmission drive?

Ans. Gear drives are known as positive power transmission drive because there is no slip in gear drive as belt drive. There is no frictional slip so, it is called as positive power transmission.

Q4. What is gear? Explain different types of gear for transmission of power with suitable diagram.

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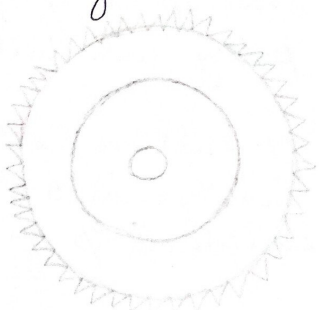
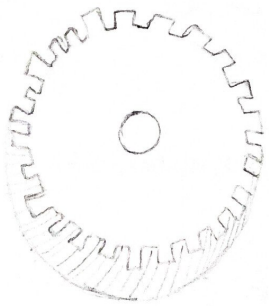
Ans: A gear is a toothed wheel attached to a rotating shaft. There are many types of gears like spur gear, helical gear, bevel gears.

- **Spur gear :-**
  This is the simplest type of gear. It has teeth parallel to the axis of rotation and is used to transmit rotation from one shaft to another parallel shaft.



- **Helical gear :-**
  This gear has its teeth inclined to the axis of rotation. It also used for the same application as spur gear. It has silent operation.
  It has ability to transmit heavy loads at high speeds.



- **Bevel gear :-**
  These gears have their teeth formed on conical surfaces and are used for transmitting motion bet" two shaft at 90°.

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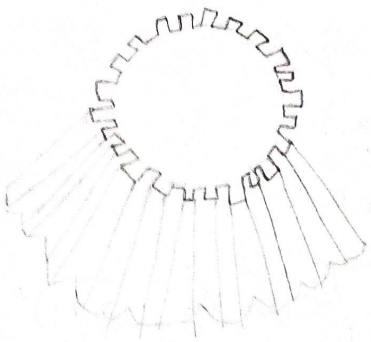
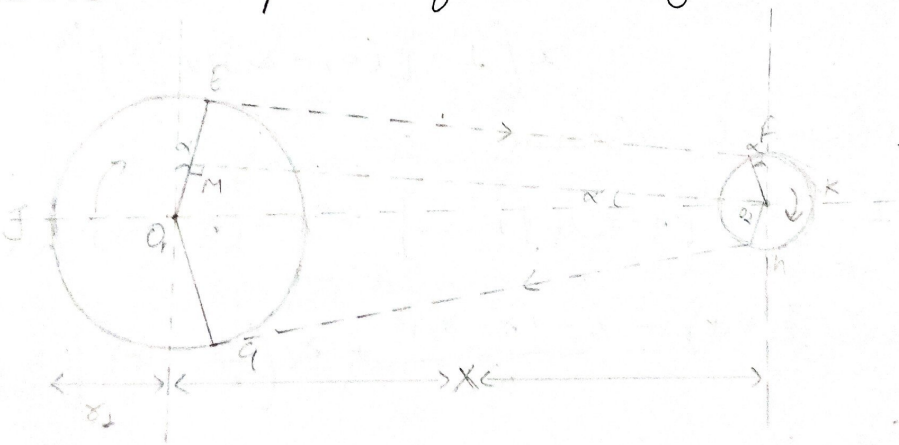


Q. Derive an expression for the length of open belt drives.



Let r_1 and r_2 be radius of larger and smaller pulley.

$X \rightarrow$ distance bet^n centres of pulley.

$L \rightarrow$ Total length of belt.

Let the belt leaves larger pulley at E & G and the smaller pulley f and H.

from figure $O_2M \perp O_1E$

Let $\angle O_1O_2M = \alpha$ radian

$$L = \text{Arc } GJE + Ef + \text{Arc } fKH + HG$$

$$= 2(\text{Arc } JE + Ef + \text{Arc } fK). \quad \text{— (1)}$$

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$$\sin a = \frac{O_1 M}{O_1 O_2} = O_1\mathcal{E} - \frac{\mathcal{E}M}{O_1 O_2}$$

$$= r_1 - r_2/x$$

$\because$ a is very small angle.

$$\sin a = a = r - r_2/x$$

$$\therefore \text{Arc } J\mathcal{E} = r_1\left(\pi/2 + a\right)$$

$$\text{Arc } FK = r_2\left(\pi/2 - a\right)$$

$$\text{and } \mathcal{E}f = MO_2 = \left[(O_1O_2)^2 - (O_1M)^2\right]^{1/2}$$

$$= \left[x^2 - (r_1 - r_2)^2\right]^{1/2}$$

$$= x\left[1 - \{(r_1 - r_2)/x\}^2\right]^{1/2}$$

Using binomial theorm

$$\mathcal{E}f = x\left[1 - \{0.5\{r_1 - r_2/x\} + \cdots\right] = x - (r_1 - r_2)^2/2x$$

$$\therefore L = 2\left[r_1\left(\frac{\pi}{2} + \alpha\right) + x - \frac{(r_1 - r_2)^2}{2x} + r_2\left(\frac{\pi}{2} - \alpha\right)\right]$$

$$= 2\left[\pi/2\,(r_1 + r_2) + \alpha\,(r_1 - r_2) + x - \frac{(r_1 - r_2)^2}{2x}\right]$$

$$= x(r_1 + r_2) + 2\alpha\,(r_1 - r_2) + 2x - \frac{(r_1 - r_2)^2}{x}$$

$$\because \alpha = \frac{r_1 - r_2}{x}$$

$$L = x(r_1 + r_2) + 2x\,\frac{(r_1 - r_2)}{x}(r_1 - r_2) + 2x - \frac{(r_1 - r_2)^2}{x}$$

$$= (r_1 + r_2) + \frac{2(r_1 - r_2)^2}{x} + 2x - \frac{(r_1 - r_2)^2}{x}$$

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Q6. Write down the difference between flat belt and V-belt drive.

Ans.

Flat Belt	V-Belt
1. Suitable for shorter center distance bet^n the shaft.	1. For longer centre distances.
2. Trapezoidal section.	2. Rectangular section.
3. Frictional grip is more.	3. Friction grip is less.
4. Since more that one belt can be used power transm-itted will be more.	4. Since single belt can be used power transmitted is less.
5. Velocity ratio is high.	5. Velocity ratio is low.
6. Slip is seldom possible	6. Slip occurs easily.

Q7. Difference between slip and creep.

Ans. Creep is due to the elastic property of the belt whereas, the conventional slip is due to insufficien frictional grip bet^n the belt and pulley. Both reduces the speed ratio.

Q8. Classify different types of power transmission system.

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Ans: Types of Power transmissions are :-

(i) Gear
(ii) Pulley & Belts
(iii) Chain drive
(iv) Friction wheels
(v) Worm drives

We will discuss about Gear and belt transmission system.

- Gears :-
A gear system is composed of two or more toothed wheels that connect and interact with each other, it transmits a rotating motion.

- Belts and Pulley :-
A belt and pulley system is composed of a pulley that rotates and pulls the belt which in turn transmits the motion to a second pulley.

Q. Two pulley, one 450 mm diameter and the other 200 mm diameter are on parallel shaft 1.95 m apart and are connected by a crossed belt. Find the length of belt required and the angle of contact bet^n the belt and each pulley. What power can be transmitted by the belt, when the larger pulley rotates 200 rev/min, if the max^m permissible tension in the belt is 1 kN, and the coefficient of friction bet^n in belt and pulley is 0.25?

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Ans:

Given $d_1 = 450mm = 0.45m$

$d_2 = 200mm = 0.2m$

$r_1 = 0.225m$

$r_2 = 0.1m$

$x = 1.95m$, $N_1 = 200rpm$, $T_1 = 1kN = 1000N$

$\mu = 0.25$

- Speed of belt $(V) = \frac{\pi d_1 N_1}{60}$

$= \frac{\pi \times 0.45 \times 200}{60}$

$= 4.714 m/s$

- Length of belt :-

$L = \pi(r_1 + r_2) + 2x + \frac{(r_1 + r_2)^2}{x}$

$= \pi(0.225 + 0.1) + 2 \times 1.95 + \frac{(0.225 + 0.1)^2}{1.95}$

$= 4.975 m$

- Angle of contact betn each pulley and belt :-

θ = angle of contact

$\sin\alpha = \frac{r_1 + r_2}{x} = \frac{0.225 + 0.1}{1.95}$

≈ 0.667

or $\alpha = 9.6°$

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$$\theta = 180^\circ + 2\alpha$$

$$= 180^\circ + 2(9.6^\circ)$$

$$= 199.2^\circ$$

$$\Rightarrow \frac{199.2}{180} \times \pi = 3.477 \text{ radian}$$

- Power :-

T_2 = tension in slack side of belt.

$$2.3 \log\left(\frac{T_1}{T_2}\right) = \mu.\theta \Rightarrow 0.25 \times 3.477$$

$$= 0.8692$$

$$\log\left(\frac{T_1}{T_2}\right) = \frac{0.8692}{2.3}$$

$$= 0.378$$

$$\frac{T_1}{T_2} = 2.387$$

$$\therefore T_2 = \frac{1000}{2.387}$$

$$= 419 N$$

$$P = (T_1 - T_2) V$$

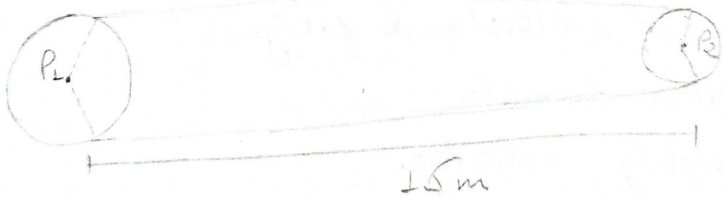
$$= (1000 - 419)\, 4.714$$

$$= 2740 W$$

$$= 2.74 kW$$

Q10. You want to transfer a power upto 15m. Which power transmission drive you will adopt. Explain with the suitable diagram.

Ans. To transmit power within 15m distance we will belt drive for power transmission and for more that 15m we can used Rope drive.



- Rope Drives

The rope drives are widely used to transmit large amount of power from one pulley to another, over a long distance. Ropes are made of cotton, hemp, manila or steel wire. The frictional grip in the case of rope drive is more than the belt drive. One of the main advantages of rope drive is that a number of drives can be taken from one driving pulley. For example, in many spinning mills, the line shaft on each floor is driven by ropes passing directly from the main engine pulley on the ground floor. For a rope drive, the

groove angle of the pulley is normally 45°.

- Steel wire rope

This is used to transmit larger power over longer distances, compared to cotton rope or hemp rope. Wire ropes are used for cranes, elevators, etc, unlike fibre ropes which are wedged between the sides of the grooves, steel ropes rest at the bottom of the grooves in the pulley.

Following are the advantages of wire ropes:-

1. It can withstand heavy load and shock load.
2. It can also withstand fatigue.
3. It is more durable.
4. It is highly reliable.

Assignment - 2

Que - ① What is the effect of adding nickel and aluminium vandium to steel?

Ans ⇒ Adding nickel to steel increases the toughness, resistance to impact and corrosion, distortion and lower distortion in quenching.

Adding vandium provides a fine-grained structure over a wide range of temperature.

Que ② What is engineering materials?

Ans ⇒ Materials engineering is an engineering field of designing and improving materials, and finding uses for materials in other fields and industries.

Que ③ Classify the engineering materials?

Ans ⇒ 1. Ferrous and non ferrous metals and alloys
2. Polymer materials
3. Glasses and ceramics

Metal and alloys are having immense application in construction words, electric power generation and transmission transportations, vehicals, agriculture, machine tools etc.

Que ④ Write down d/f properties of moulding sand.

Ans - ① Refractoriness : Ability to withstand the high temp.

2. Strength : Moulding sand should have sufficient strength to retain the mould shape.

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3. Flowability : Ability to get compacted to take up the required shape.

4. Porosity : Moulding sand should be porous enough to allow the gases picked up by the molten metal.

5. Strength or cohesiveness : Ability of moulding sand grains to adhere each other.

6. Adhesiveness : Property to adhere to the wall of moulding bores

7. Collapsibility : Readiness of the moulding sand to get collapsed.

8. Durability : Ability to withstand the heating and cooling during repeated

9.) Chemical resistivity : Ability to resist any chemical rxn.

Que ⑤ Write down the difference b/w soldering and Brazing.

Ans:

Brazing	Soldering
1) Used for joining dissimilar metals, pipes, copper, tubes etc	1) To make electrical connections to make printed circuit boards, joining light sheet metals etc
2) Melting temp of the filler material is above 450°C	2) Below 450°C
3. Fluxes are borax, fluroides etc	3. zinc chloride
4. Joint has a better strength	4. Strength is comparitively less

Que ⑥ Explain the working of gas welding and explain d/f types of flames generated in oxy-acetylene welding with suitable diagram?

Ans ⇒ In oxy-acetylene welding, the flame is produced by burning a mixture of oxygen and acetylene. This mixture burns to produce the high flame temp. upto 3480°C in two stage reaction

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3. Flowability

Porosity

Strength

Adhesi

Collap

8. Du

9.) Ch

I st stage :

$$C_2H_2 + O_2 \longrightarrow H_2 + 2CO$$

This rxn occurs near the end of torch tip

II nd stage :

$$2CO + O_2 \longrightarrow 2CO_2$$

$$2H_2 + O_2 \longrightarrow 2H_2O$$

The oxygen for above two rxn is obtained from the atomosphere. Initially the acetylene is supplied and it is ignited with a friction spark lighter. After this, oxygen is supplied with the help of a seprate valve and the nature of flame is adjusted. A filler metal in the form of a rod is held in the flame and is melted to fill the weld cavity.

- Types of flame



(a) Natural flame



(b.) carburising flame (excess acetylene)

(c.)



Oxidising flame (excess oxygen)

Que (7) Explain dif type of extrusion process

Ans ⇒ • Direct or forward extrusion:

In this, a block of metal is placed in a closed container. A die with a proper die holder is placed at one end of the container. A dummy block or pressure plate is placed at the end of the ram. This is to avoid direct contact of the hot metal and the ram. In this the direction of flow to the extruded metal is along the same direction of the ram movement.

• Indirect or back ward extrusion:

In this a block of metal is placed in a closed container is fully closed by a closure plate. A hollow ram with a die is placed on the other end of the container. extrusion is carried out by forcing the metal through the die orifice by driving the hollow ram. The extruded metal flows through the hollow ram. The direction of flow of the extruded metal is in the opposite direction of the ram movement.

Que 8.) Explain the pattern allowances used in foundary

Ans ⇒ shrinkage allowances: It is the allowances given on the pattern size for avoiding any change the dimension of the casting because of shrinkage

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- Moulding allowances: It is given on the size of pattern I st stage for finishing the rough surface of the casting.

- Draft allowances: It is the taper allowed on vertical II rd stag faces of a pattern for easy removed of the pattern without damaging the mould cavity.

- Distortion or camber: Due to internal stresses developed during cooling, casting may be distorted. It is given to avoid this by intentionally defecting the leg inwards.

- Shake or rapping allowances: For easy removal of the pattern from moulding sand this allowances is given do ~~avoid this~~ the shape of pattern.

Que (9) Describe the various methods of heat treatment with the help of suitable daigram.

Ans ⇒ The heat treatment methods are

1.) Annealing
2.) Normalizing
3.) Hardening
4.) Tempering

Que (10)

Ans ⇒ 1) Annealing: The heating temp varies from 750 - 975 °C holding at this temp. followed by slow cooling

2.) Normalising: It is used for grain refinement and obtain uniform condition in material.

(i) Heating temp varies from 750° - 975°C

(ii) Holding the work piece for a short period & allowing it to air cool.

3.) Hardening: It is the process which is applied to almost all the tools and imp machine parts. Its aim is to develop high hardness, increased tensile strength & wear resistance application.

(i) heating upto 750- 975°C temp

4.) Tempering: The conventional method of tempering consists of reheating the hardened steel to a range of temp upto 400°C & holding it for a considerable time.

Que (10) Suppose you want to manufacture a bike engine which manufacturing process you will adopt and why?

Ans ⇒ Bike engine can be manufactured by metal casting manufacturing process we should adopt

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this process because ~~bike~~ bike engines have very complex shape. Different solid shapes on different sides. It can be prepared by too split method to design the bike engine materials used in manufacturing is cast iron, aluminium & aluminium alloys.

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SESSION 2022-23
Assignment Sheet-2

Campus: PCE Course: B.Tech. **Class/Section: .....** **Date: .....**
Name of Faculty: ..... **Name of Subject: BME** **Code: 1FY3/2FY3-07**
Date of Preparation:..... **Scheduled Date of Submission: .....**

		Marks	CO	BL	PO
Q.1	What is slip?	1	CO1	L1	PO1
Q.2	Explain the velocity ratio of belt drive with the consideration of slip.	1	CO1	L1	PO1
Q.3	Why gear drives are known as positive power transmission drive?	1	CO1	L1	PO1
Q.4	What is Gear? Explain different types of gear for transmission of power with suitable diagram.	2	CO3	L1	PO1
Q.5	Derive an expression for the length of open belt derives.	2	CO3	L3	PO1
Q.6	Write down the difference between soldering and brazing.	2	CO2	L2	PO1
Q.7	Explain the working of gas welding and explain different types of flames generated in oxy-acetylene welding with suitable diagram.	2	CO3	L3	PO1
Q.8	Describe the various methods of heat treatment with the help of suitable diagram.	2	CO3	L3	PO1
Q.9	Two pulleys, one 450 mm diameter and the other 200 mm diameter are on parallel shafts 1·95 m apart and are connected by a crossed belt. Find the length of the belt required and the angle of contact between the belt and each pulley. What power can be transmitted by the belt, when the larger pulley rotates at 200 rev/min, if the maximum permissible tension in the belt is 1 KN, and the coefficient of friction between the belt and pulley is 0·25 ?	3.5	CO4	L4	PO2
Q. 10	Explain the various pattern allowances used in foundry. Also explain different properties of molding sand.	3.5	CO3		PO1

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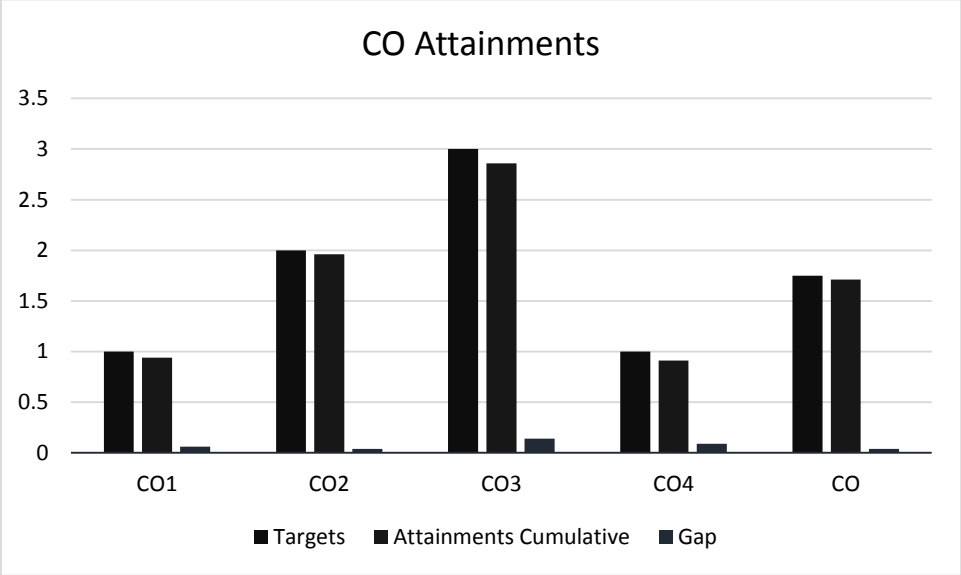
Section D (CSE), 2023-24

- **CO-Gap Identifications for Quiz/ 1:**

CO Attainments					
Overall CO Attainments for PO	**CO1**	**CO2**	**CO3**	**CO4**	**CO**
Targets	**1**	**2**	**3**	**1**	**1.75**
Attainments Cumulative	**0.94**	**1.96**	**2.86**	**0.91**	**1.71**
Gap	**0.06**	**0.04**	**0.14**	**0.09**	**0.04**



Gaps Identified for Quiz 1:

Describe what the reasons for gaps are:

- Slight Gap

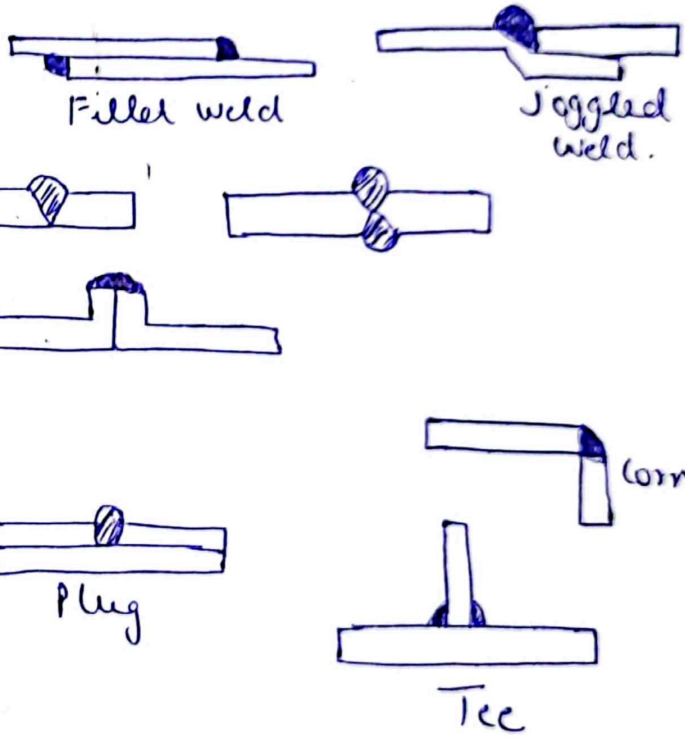
Activities Decided to bridge the gap:

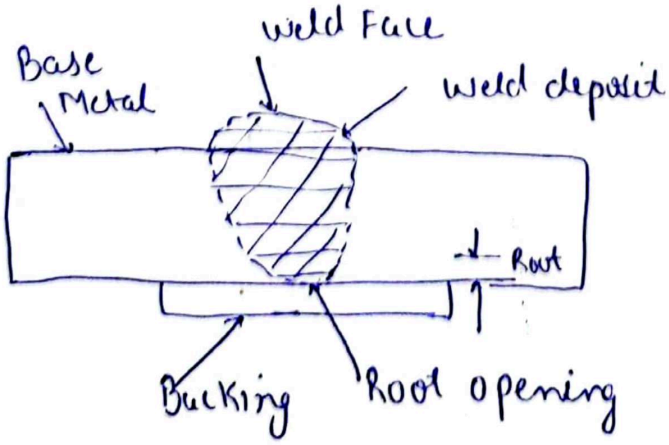
- Notes were circulated to the students related to the materials and gears and revised the important definition.

Welding → It is a metal joining process in which joining of metals is done by application of heat with or without application of pressure.

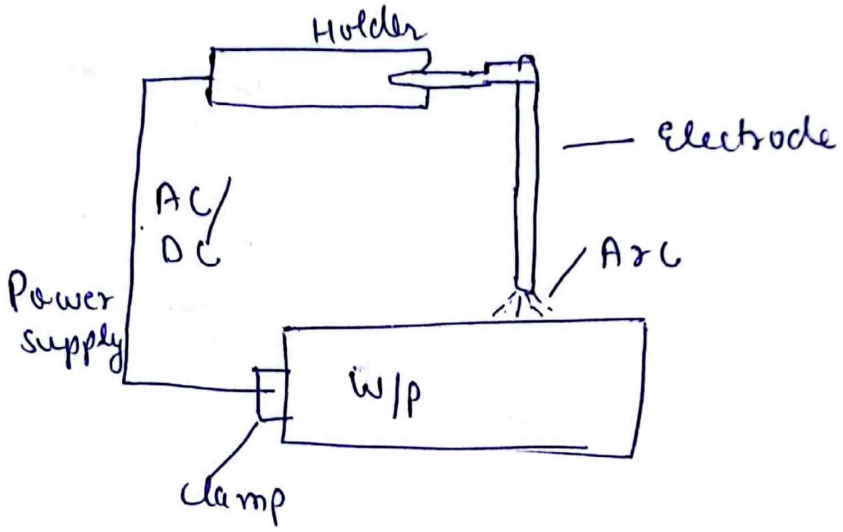
Types of Welded joint →

1. Lap joints
2. Butt joint
3. Edge joint
4. Corner joint
5. Plug joint
6. Tee joint





ARC Welding → Process of joining the metal by melting their edges with an electric arc. When two conductors are touched & then seperated by a small distance, electrons are librated from the cathode & move towards anode. Also the positively charged ions moves from anode towards cathode.



① DCSP → Electrode → ⊖

W/p → ⊕

② DCRP → Electrode → ⊕

W/p → ⊖

Gas Welding →

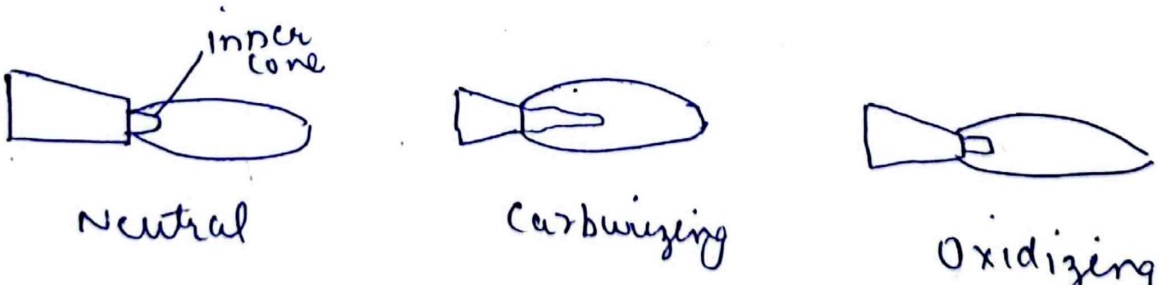
It is joining of metal by melting their edges by a flame resulting from burning of a gas fuel and oxygen.

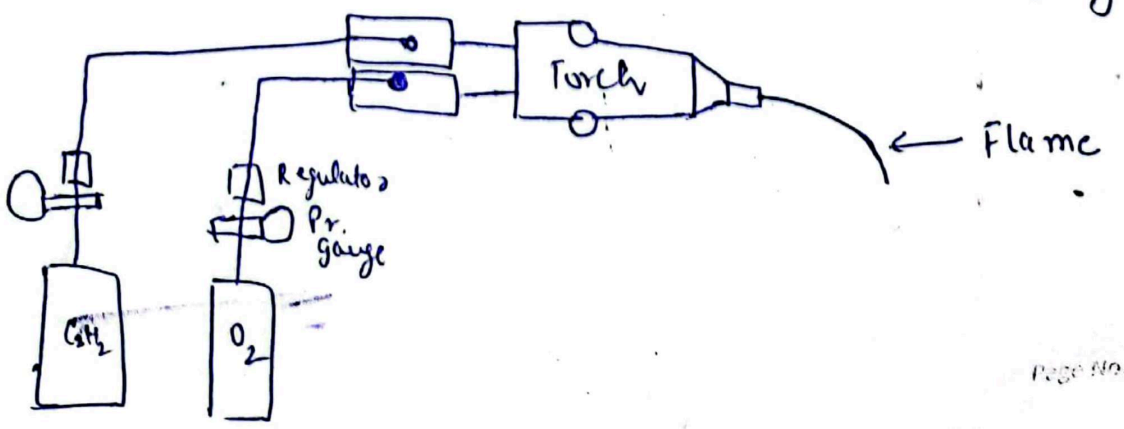
$$C_2H_2 + O_2 \longrightarrow H_2 + 2CO$$

$$2CO + O_2 \longrightarrow 2CO_2$$

$$2H_2 + O_2 \longrightarrow 2H_2O$$

1. Netural flame $C_2H_2 : O_2$ [Equal Proportion]
2. oxidizing Flame [Excess of Oxygen]
3. Reducing Flame [Excess of C_2H_2]

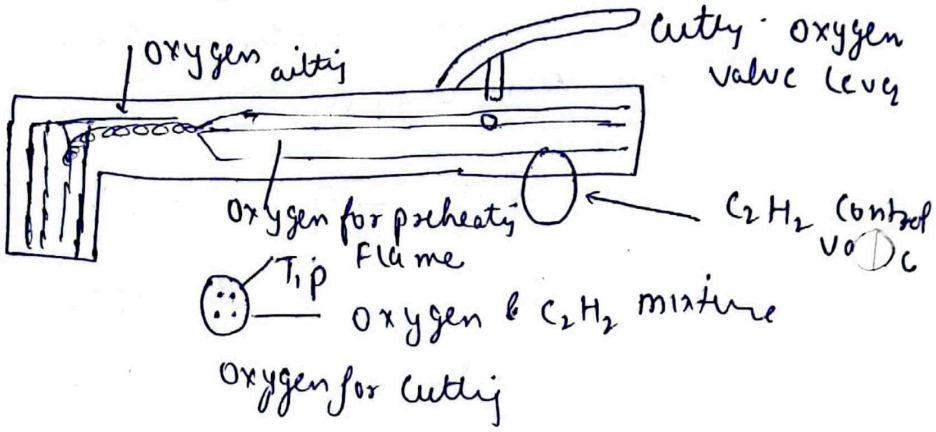




Gas Cutting →

It is a process to cut ferrous metal & alloys. and steels.

$$2Fe + O_2 \longrightarrow Fe_3O_4 + Heat$$



Brazing	Soldering
① used for joining dissimilar metal, pipes, copper tubes	① To make electrical connection to make printed circuit boards.
② Melting temp² of filler material bel. above 450°C	② Below 450°
③ Filler material are copper based alloy & silver based alloy.	③ Alloy of lead & tin
④ Joint has a better strength	④ strength is comparatively less
⑤ Fluxes are borax, fluorides & chlorides.	⑤ Zinc chloride.

3,6,8,9,10

DETAILED LECTURE NOTES

Unit-5+6 Questions

1. What is the effect of adding nickel and vanadium to steel?

Nickel can increase the strength and toughness and improve the hardenability of the steel and increases the corrosion resistance of steel.

Vanadium increases the temp. stability of quenched steel and produce a secondary hardening effect. Vanadium can refine the grains, increase the strength and yield ratio and low temperature toughness after normalizing and improve the welding perfomance of ordinary low alloy steel.

2. What is Engineering material?

Engineering materials refers to a group of materials that are used in the construction of manmade structures and components. The primary function of an engineering material to withstand applied loading without breaking and without exhibiting excessive deflection. The major classifications of engineering materials include metals, polymers, ceramics and composites.

4. Write down the difference b/w soldering and brazing.

Soldering - Soldering is one of the oldest and most popular technique used for joining similar or dissimillar metals. It uses a filler material to join parent materials that remain solid and if is low-temperature analog to brazing which uses filler alloys with melting temperature below (450c). The process may or may not require a fluxing agent. The filler metal is called solder which when solidifies, is then bounded to the metal parts to join them. Soldering is extensively used in the electronics industry for joining wires, capacitor, resistor etc with the joining plate.

Brazing - Brazing is yet another metal process in which two or more or metals are joined together by heating and melting a filler metal, which then bind the two pieces together and join them.

Although it is not as strong as fusion welding, it is the strongest form of metal bonding without melting the parent metal of the components being joined together. So this process, requires more heat input than other soldering operations such as mechanical fastening, welding and so on. Brazing is necessarily done at temp. above 450°C but below the critical temp. of metal.

5. Explain different properties of molding sand.

① Refractoriness = It is the ability of the moulding sand to withstand the high temp. of the molten metal so that it does not cause fusion.

② Strength = The moulding sand should have sufficient strength to retain the mould shape under green, dry and hot conditions respectively.

③ Flowability = Flowability is the ability of the moulding sand to get compacted to take up the required shape. It increases as clay and water contents increase.

④ Permeability = The moulding sand should be porous enough to allow the gases picked up by the molten metal, while transferring or gases generated in the moulded to escape from the mould. The capacity of the moulding sand is known as permeability.

⑤ Collapsibility = Collapsibility is the readiness of the moulding sand to get collapsed, after the solidification of the casting.

⑥ Durability = It is the ability of the moulding sand to withstand the heating and cooling during repeated usage.

⑦ Chemical resistivity => It is the ability of the moulding sand to resist any chemical reaction with the molten metal.

Q. Explain different types of extrusion process?

① Direct or Forward Extrusion => In the direct extrusion, a block of metal is placed in a closed container. A die with a proper die holder is placed at the end of the container and a ram at the other end of container. A dummy block or press are plate is placed at the end of the ram. This is to avoid direct contact of the hot metal and the ram. Extrusion is done when the metal is forced through the die by the ram. The extruded product will have the same size and shape as that of the die orifice.

In direct extrusion, the direction of flow of the extruded metal is along the same direction of the ram movement.

② Indirect or Backward Extrusion => In d indirect extrusion, a block of metal is placed in a closed container. One end of the container is fully closed by a closure plate. A hollow ram with a die is placed on the other end of container. Extrusion is carried out by forcing the metal through the die orific by driving the hollow ram. The extruded metal flows through the hollow ram.

In indirect extrusion, the direction of flow of the extruded metal is in the opposite direction of ram movement.

③ Tube Extrusion ⇒ Tubes can be manufacted by the ext- ~~rus~~ rusion process. The tube extrusion process is a direct extrusion with a additional attachment for making tubular shape. In tube extrusion process, a mandrel is placed at the face of the container opening.

When the ram is moved, the metal is forced through the die orific. The extruded metal flows around the mandrel producing a tubular shape. The clearance b/w the mandrel and the die wall determines the wall thickness of the extruded tube.

DETAILED LECTURE NOTES

Campus: ..... Course: ..... Class/Section: ..... Date: .....
Name of Faculty: ..... Name of Subject: ..... Code: .....

UNIT-6
Engineering Materials

Classification of Engg. Materials

1. Ferrous & Non Ferrous metal & alloys
2. Polymer Materials → Rubber, leathers, Plastics
3. Glasses and Ceramics → Bricks, rocks, minerals, abrasives

Properties →

Physical Properties →

1. Density
2. Melting point
3. Specific heat
4. Thermal Conductivity
5. Thermal Expansion
6. Electrical Conductivity

Mechanical Properties →

1. Tensile strength
2. Compressive strength
3. Hardness
4. Torsional strength
5. Brittleness
6. Machineability
7. Fatigue strength

Chemical Properties

Corrosion Resistance.

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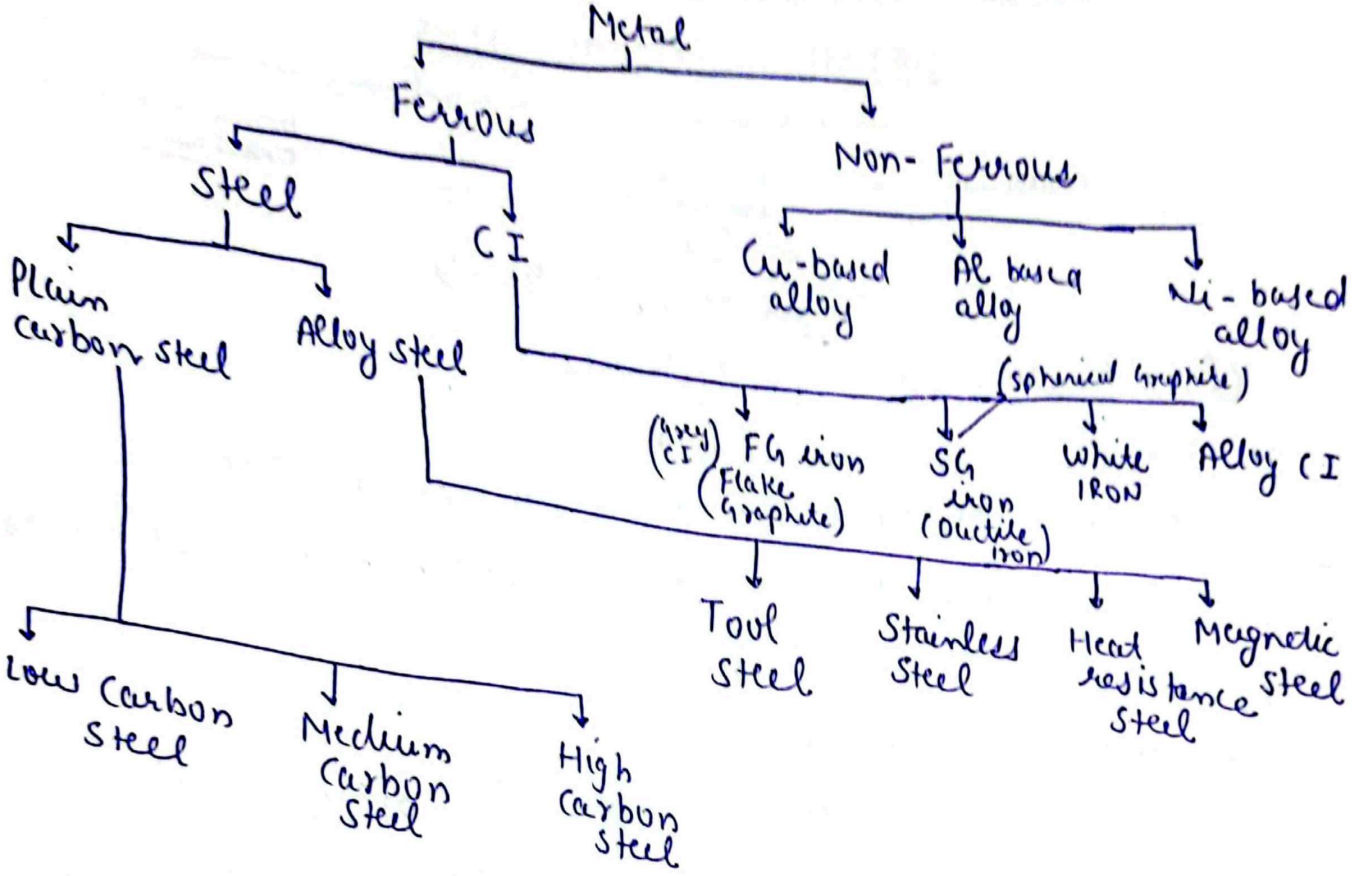
Classification of Metals & alloys



Pig IRon → It form the raw material that is obtained after chemical reduction of iron ore in Furnace.

Iron Ore + Coke + Lime stone + Air → Pig iron
(Smelting Process)

Cast iron → It is obtained by re-melting of pig iron with limestone + steel scrap + CI scrap.

1. F.G or grey iron → 0.8% C in Fe_3C & remaing free carbon
2. S.G iron → Magnesium take nodular or spherical shape.

It is used in Hydraulic cylinder, valves, cylinder heads

Q1. Ans

③ White iron → Chilled cast iron

④ Alloy cast iron

Steel →

Plain carbon steel → Carbon decides the strength & hardness of steel.

Q2. Ans

Structural steel → ⓐ Low carbon steel / Mild steel → 0.05 - 0.30 % C

Connecting rod, Crankshaft. ⓑ Medium carbon steel → 0.30 - 0.6 % C

Loco-wheels, rails ⓒ High carbon Steel → 0.60 - 1.5 % C

→ Increase in Carbon → decreases the ductility, formability, machinability, weldability, corrosion resistance & conductivity

Q3

Alloy steel →

① increase hardenability, strength, toughness, wear resistance, corrosion resistance, Magnetic prop

① Tool steels →

Low alloy tool steel → Cr + Si + Mn + W

High alloy → W + V + Cr (18 / 1 / 4) [W + Cr + V 18 : 4 : 1]

② Stainless steel

③ Heat resistance steel

④ Magnetic steel.

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Non-Ferrous Metal & Alloy →

1. Soft & ductile
2. Good formability
3. Good resistance to corrosion
4. Easy to cast, weld, machine

Copper & its alloy → (1) High thermal conductivity

(2) Low oxidisability

(3) Good ductility

Types of alloy

(a) Brass → copper + Zinc + tin + lead + Al

(b) Bronzes → copper + Tin + Al + Si + Mn

(c) Muntz metal

(d) Cartridge Brass

(e) Silicon Bronze

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DETAILED LECTURE NOTES

Campus:	Course:	Class/Section:	Date: .....
Name of Faculty:		Name of Subject:	Code: .....

Heat treatment

Heating & Cooling operation applied to metal & alloy in solid state in order to obtain the desired properties.

Purpose →
- (a) Improvement in ductility
- (b) Relieving internal stresses
- (c) Refinement of grain
- (d) Increasing hardness or strength.

Heat treatment Furnace

1. Muffle furnace
2. Conveyer furnace
3. Bath furnace. (Salt / Lead)
4. Induction heating furnace

Heat treatment Processes →

1. Annealing
   - (a) Full annealing
   - (b) Stress relief annealing
   - (c) Process annealing
   - (d) Spheroidise annealing

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② Annealing
③ Normalising (at outside furnace / Fast cooling)
④ Hardening (quenching in water)
Tempering (relieve strain, decrease brittleness improve toughness)
↳ Reheating + Holding + Slow cooling
upto 400°C

Stages of Heat Treatment →

① Heating a metal/alloy to definite (750-975°C) temp
② Holding at that temp
③ Cooling at a rate necessary

Case Hardening → (wear resistant surface)

① Carburising (CO atmosphere)
② Nitriding (Ammonia atmosphere)
③ Cyaniding (Carbon + nitrogen)
④ Flame Hardening (selected area is heated + quenching)
⑤ Induction hardening (High frequency eddy current + Hysteresis current on localised area)

I B.TECH. (I Sem.)

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

Roll No. _____

SECOND MID TERM EXAMINATION 2023-24

Code: 1FY3-07 Category: ESC Subject Name– BASIC MECHANICAL ENGNEERING (BME)

(All Branches)

Course Credit: 02

Max. Marks: 60

Max. Time: 2 hrs.

NOTE:- Read the guidelines given with each part carefully.

Course Outcomes (CO):

At the end of the course the student should be able to:

CO1: Students will be able to retrieve basic concepts of thermal and manufacturing process. **(Recall/Remembering)**

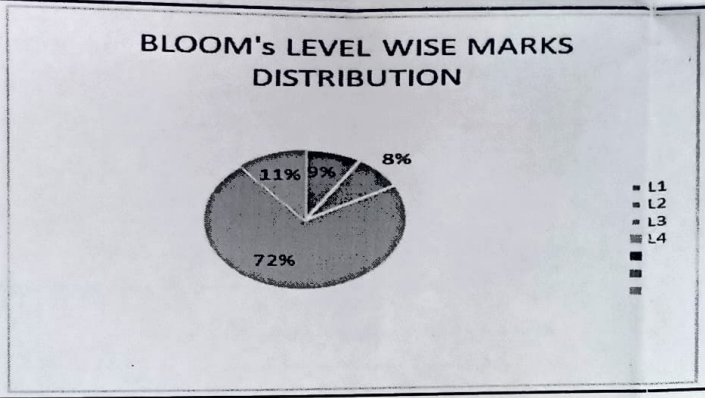
CO2: Students will able to compare different types of thermal and manufacturing processes and. **(Understand)**

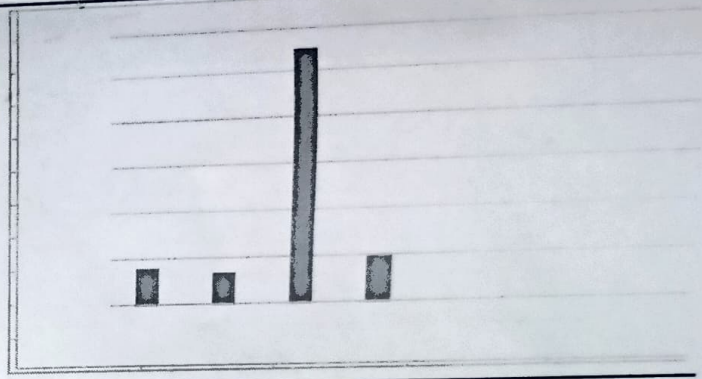
CO3: Students will able to annotating about the functioning of turbine & pumps, IC engines, refrigeration system, modes of transmission of power, materials and primary manufacturing process. **(Apply)**

CO4: Student will be able to appraise the fundamental knowledge of thermal engineering, in addition to understanding of power transmission to solve the industrial and societal issues. **(Examine)**

	PART - A: (All questions are compulsory) Max. Marks (10)				
		Marks	**CO**	**BL**	**PO**
Q.1	What is the velocity ratio of belt drive?	**2**	CO1	L1	PO1
Q.2	Define toughness and brittleness.	**2**	CO1	L1	PO1
Q.3	What is the Scavenging Process?	**2**	CO1	L1	PO1
Q.4	What is metal casting?	**2**	CO1	L1	PO1
Q.5	Write the difference between Slip and Creep in belt drive.	**2**	CO2	L2	PO1
	PART - B: (Attempt 4 questions out of 6) Max. Marks (20)				
Q.6	Classify the Engineering materials and explain the application and constituents of some of the important ferrous and non-ferrous materials.	**5**	CO3	L3	PO1
Q.7	Differentiate Two stroke and four stroke CI engine.	**5**	CO2	L2	PO1
Q.8	What is Gear? Explain different types of gear for transmission of power with suitable diagrams.	**5**	CO3	L3	PO1
Q.9	Explain the working of Cupola furnace with suitable diagram.	**5**	CO3	L3	PO3
Q.10	Derive an expression for the length of cross belt drives.	**5**	CO3	L3	PO1
Q.11	Explain the working of gas welding and explain different types of flames generated in oxy-acetylene welding with suitable diagram.	**5**	CO3	L3	PO1
	PART - C: (Attempt 3 questions out of 4) Max. Marks (30)				
Q.12	Two pulleys, one 450 mm diameter and the other 200 mm diameter are on parallel shafts 1·95 m apart and are connected by a crossed belt. Find the length of the belt required and the angle of contact between the belt and each pulley. What power can be transmitted by the belt, when the larger pulley rotates at 200 rev/min, if the maximum permissible tension in the belt is 1 KN, and the coefficient of friction between the belt and pulley is 0·25 ?	**10**	CO4	L4	PO2

Q.13	What is the meaning of heat treatment? Describe the various stages in heat treatment and objectives with the help of suitable diagram.	10	CO3	L3	PO1
Q.14	Explain the working of Otto cycle with the help of PV and TS diagram.	10	CO3	L3	PO1
Q. 15	Write Short note on: a) Drawing b) Extrusion c) Rolling d) Upsetting e) Pattern Allowances	10	CO3	L3	PO1





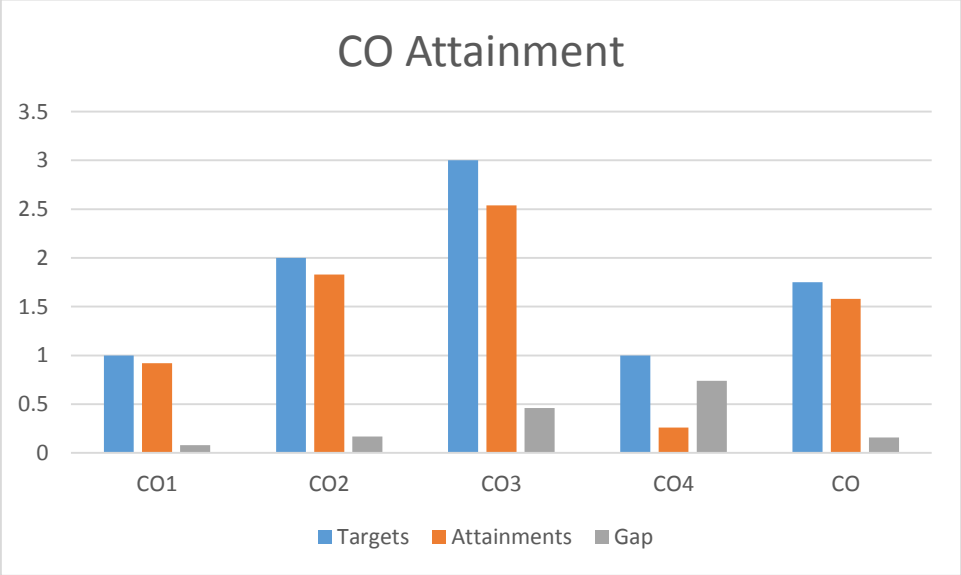
BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analyzing, 5 – Evaluating, 6 - Creating)

CO – Course Outcomes; PO – Program Outcomes

1250 1250 x 2.75 → 29.45 Tons

CO-Gap Identifications for Mid-2:

CO Attainments					
Overall CO Attainments for PO	**CO1**	**CO2**	**CO3**	**CO4**	**CO**
Targets	**1**	**2**	**3**	**1**	**1.75**
Attainments Cumulative	**0.92**	**1.83**	**2.54**	**0.26**	**1.58**
Gap	**0.08**	**0.17**	**0.46**	**0.74**	**0.16**



Gaps Identified for Mid-2:

- 5 Students were not able to give the proper explanation of problems related Gear. Due to this reason the values of CO3 is showing the more gap.
- 4 students were not able to give the proper reply of Basic definition correctly.

Activities Decided to bridge the gap after Mid-2:

- Notes were circulated to the students related to the IC engine and revised the important definition.

1E3107

Total No. of Questions : 22

Roll No. : 23EPCCS048

Total No. of Pages : 03

1E3107

B.Tech. I-Sem. (Main/Back) Exam. - 2024

1FY3-07/Basic Mechanical Engineering

Time : 3 Hours

Maximum Marks : 70

Instructions to Candidates :

Attempt all ten questions from Part-A, five questions out of seven questions from Part-B and three questions out of five questions from Part-C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly. Use of following supporting material is permitted during examination.

(Mentioned in Form No. 205)

1. .....

2. .....

PART-A **[10x2=20]**

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1. State the Zeroth law of thermodynamics.

Q.2. Discuss the two important properties of Steam.

Q.3. What are the main components of IC engine?

Q.4. What is meant by priming in centrifugal pumps?

Q.5. Define the performance measure of a refrigerator and a heat pump.

Q.6. Why gear drive is called as positive drive?

Q.7. List the different fields of mechanical engineering.

Q.8. What is the difference between open belt and cross belt?

Q.9. Give the name of four types of patterns.

Q.10. What is 18:4:1 steel? State its application.

PART-B **[5x4=20]**

(Analytical/Problem solving questions)

Attempt any five questions

Q.1. Explain the second law of thermodynamics. Is it possible for a heat engine to operate without rejecting any waste heat to a low temperature reservoir? Explain.

Q.2. Discuss the classification of the Steam Boilers. Explain the working of any boiler with the neat sketch.

Q.3. Derive an expression for the air standard efficiency of Otto cycle. Draw neat P-V and T-S diagrams.

Q.4. Differentiate among the welding, brazing and soldering.

Q.5. Compare the working of two stroke and four stroke Internal Combustion Engine.

Q.4. What is meant by priming in centrifugal pumps?

Q.5. Define the performance measure of a refrigerator and a heat pump.

Q.6. Why gear drive is called as positive drive?

Q.7. List the different fields of mechanical engineering.

Q.8. What is the difference between open belt and cross belt?

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PART-B

[5x4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1. Explain the second law of thermodynamics. Is it possible for a heat engine to operate without rejecting any waste heat to a low temperature reservoir? Explain.

Q.2. Discuss the classification of the Steam Boilers. Explain the working of any boiler with the neat sketch.

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Q.4. Differentiate among the welding, brazing and soldering.

Q.5. Compare the working of two stroke and four stroke Internal Combustion Engine.

POORNIMA
COLLEGE OF ENGINEERING

Summery Sheet

Name of faculty	**Dr Ankit Tyagi**
Class-	**B. Tech –I SEM**
Branch	**CSE, Section D**
Course Code	**1FY3-07**
Course Name	**Basic Mechanical Engineering**
Session	**(2023-2024)**

COURSE OUTCOMES

After completion of course

i. 1FY3-07(CO1)	Students will be able to describe concepts of thermal, functional design of machine elements, materials and primary- manufacturing process. **(Recall/Remembering)**
ii. 1FY3-07(CO2)	Students will able to classify different types of turbines and power plants, pumps and IC engines, refrigeration system, transmission of power, engineering materials and primary manufacturing processes. **(Understand)**
iii. 1FY3-07(CO3)	Student will be able to apply the fundamental knowledge of thermal engineering, in addition to understanding of materials and primary- manufacturing process to solve the industrial and societal issues. **(Apply)**
iv. 1FY3-07(CO4)	Students will able to examine about the turbine & pumps, IC engines, refrigeration system, modes of transmission of power, materials and primary manufacturing process. **(Examine)**

CO-PO/PSO MAPPING AND TARGETS

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO4	-	1	-	-	-	-	-	-	-	-	-	-	-	2	1

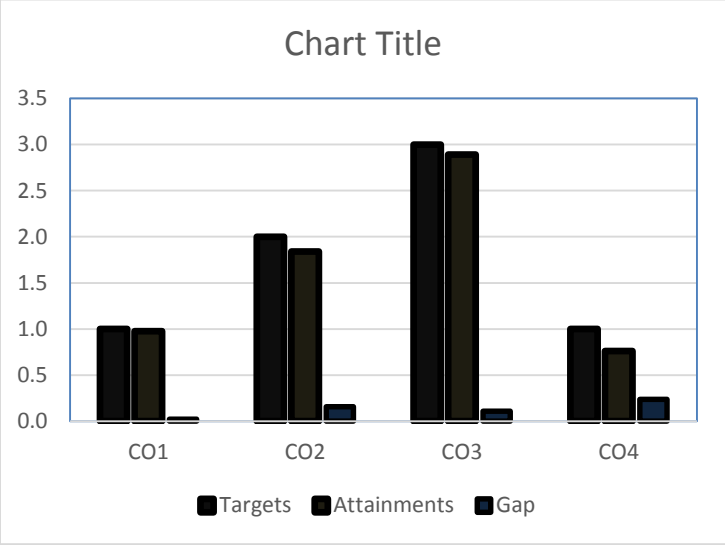
Level of course

Course Category	Level3	Level2	Level1
B	60% of students getting >65% marks	50-60% of students getting >65% marks	40-50% of students getting >65% marks

ACTIVITY WISE ASSESSMENT TOOLS

Sr. No.	Activity	Assessment Method	Tools	Weightage Marks	Recommendation
1.	**Class Test**	**Direct**	**Marks**	**50**	**For CO1-CO4**
2.	**Open Book Test**	**Direct**	**Marks**	**25**	**For CO1-CO4**
3.	**Quiz**	**Direct**	**Marks**	**10**	**For CO4**
4.	**MidTerm1**	**Direct**	**Marks**	**60**	**For CO1-CO4**
5.	**MidTerm2**	**Direct**	**Marks**	**60**	**For CO1-CO4**

CO-GAP IDENTIFICATIONS Mid- 1				
	CO1	CO2	CO3	CO4
Target	1	2	3	1
Achieved	0.97701	1.84181	2.89286	0.7619
Gap	0.02299	0.15819	0.10714	0.2381



Gaps Identified:

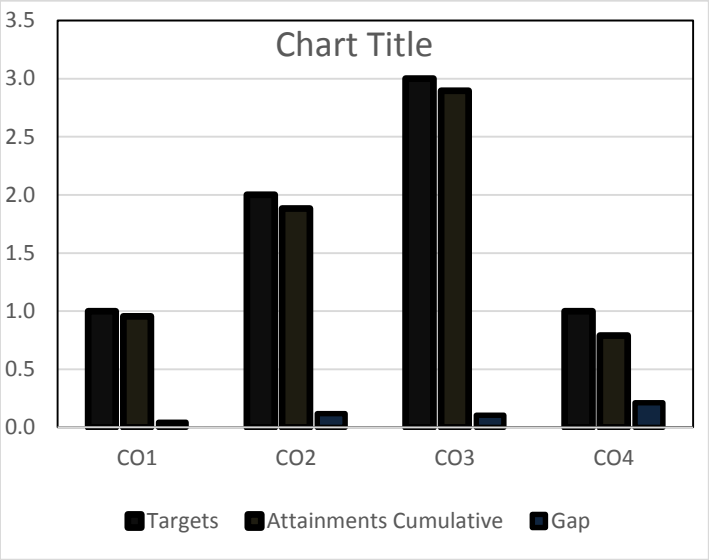
Describe what the reasons for gaps are

1. There is slightly gap in Activity exam.

Activities decided to bridge the gap

1. Focus on more numbers of repetitive basic formula based questions will be solved in classroom practices and also more focus given to weak students in assignment.

CO-GAP IDENTIFICATIONS Mid- 2				
CO Attainments for PO	CO1	CO2	CO3	CO4
Targets	1	2	3	1
MID I Attainments	0.97701	1.842	2.8929	0.7619
Attainments Mid II	0.93333	1.922	2.9	0.8161
Attainments Cumulative	0.95517	1.882	2.8964	0.789
Gap	0.04483	0.118	0.1036	0.211



Gaps Identified:

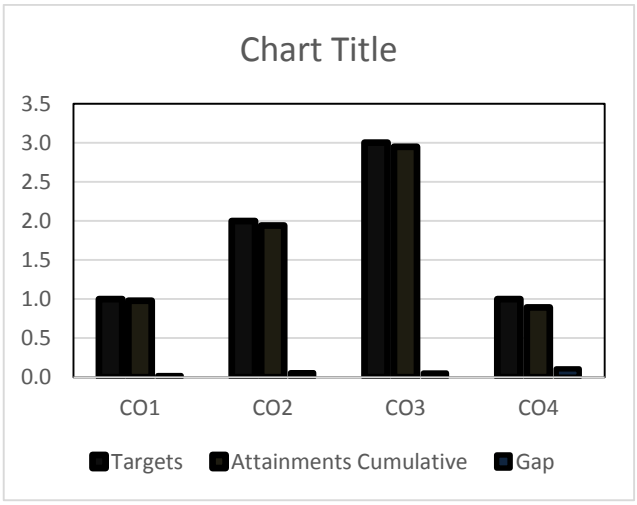
Describe what the reasons for gaps are

2. There is slightly gap in Activity exam.

Activities decided to bridge the gap

1. Focus on more numbers of repetitive basic formula based questions will be solved in classroom practices and also more focus given to weak students in assignment.

CO-GAP IDENTIFICATIONS ACTIVITY				
CO Attainments for PO	**CO1**	**CO2**	**CO3**	**CO4**
Targets	**1**	**2**	**3**	**1**
D1Attainments	**0.9552**	**1.882**	**2.8964**	**0.789**
Attainments D2	**1**	**2**	**3**	**1**
Attainments Cumulative	**0.9776**	**1.941**	**2.9482**	**0.8945**
Gap	**0.0224**	**0.059**	**0.0518**	**0.1055**



Gaps Identified:

Describe what the reasons for gaps are

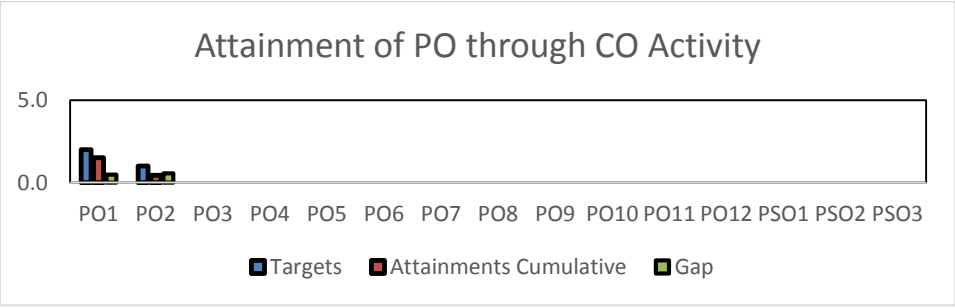
3. There is slightly gap in Activity exam.

Activities decided to bridge the gap

1. Focus on more numbers of repetitive basic formula based questions will be solved in classroom practices and also more focus given to weak students in assignment.

POs and PSOs GAP IDENTIFICATION

Attainment of PO through CO(Class Test, OBT and Quiz) Component															
2FY3-07	**PO**												**PSO**		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
Targets	**2.0**	**1.0**													
Achieved	**1.5**	**0.4**													
Gap	**0.5**	**0.6**													
Attainment of PO through CO(MIDTERM-I) Component															
2FY3-07	**PO**												**PSO**		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
Targets	**2.0**	**1.0**													
Achieved	**1.5**	**0.3**													
Gap	**0.5**	**0.7**													
Attainment of PO through CO(MIDTERM-II) Component															
2FY3-07	**PO**												**PSO**		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
Targets	**2.0**	**1.0**													
Achieved	**1.6**	**0.3**													
Gap	**0.4**	**0.7**													



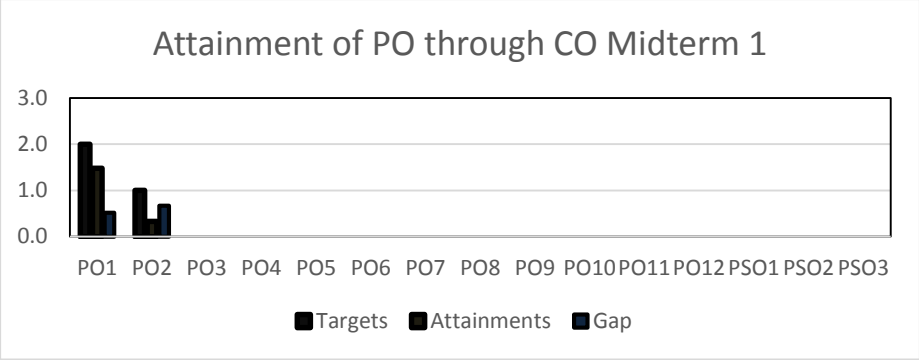
Gaps Identified:

Describe what the reasons for gaps are

Slightly Gap is identified because few students got the less marks in assignment and OBT.

Activities decided to bridge the gap

More focus on assignments practice and given attention on weak students as well as irregular students.



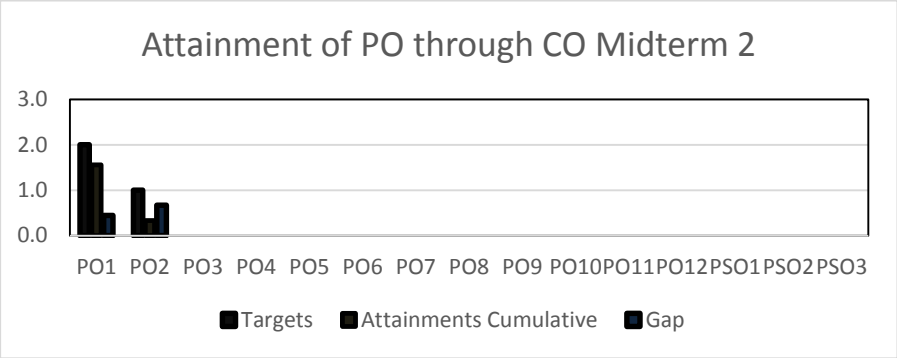
Gaps Identified:

Describe what the reasons for gaps are

Gap identified in PO1 and PO2. Because of few students were late admission and late joining of classes.

Activities decided to bridge the gap

Extra classes were conduct and provide notes.



Gaps Identified:

Describe what the reasons for gaps are

1. There is gap identified in PO analysis because few students keen less interest in numerical and got less marks in Midterm-I and midterm –II.

Activities decided to bridge the gap

1. More assignments and practice of repetitive design problems

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POORNIMA
COLLEGE OF ENGINEERING

COURSE: B.Tech SEMESTER: I/II

SUBJECT: Basic of Mechanical Engineering

SUB. CODE: 1FY3-07/2FY3-07

CONTENT: RTU Course/Subject Syllabus, Blown-up, Deployment, Zero Lectures, Detailed lecture notes with cover page, Tutorial/Home-Assignment Sheets etc

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SESSION: 2023…-2024….

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