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2.3.1 Assignment Sheet (Sample)

(2023-24)

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Assignment-1

Software Engineering (3IT4-07)

Time: 50 min. M.M. 20

Date: 15/10/2023

1.	CO1	PO1	Define the meaning of software design, explain the design fundamentals for software design. (5)
2.	CO1	PO2	What do you mean by effective modular design, explain in detail. (5)
3.	CO2	PO4	Explain the Design Documentation with example. (5)
4.	CO1	PO3	List the program evaluation and explain programming styles. (5)

Solution 1:

Software Design is also a process to plan or convert the software requirements into a step that are needed to be carried out to develop a software system. There are several principles that are used to organize and arrange the structural components of Software design. Software Designs in which these principles are applied affect the content and the working process of the software from the beginning.

Principles Of Software Design :

1. **Should not suffer from "Tunnel Vision" –**
   While designing the process, it should not suffer from "tunnel vision" which means that is should not only focus on completing or achieving the aim but on other effects also.

2. **Traceable to analysis model –**
   The design process should be traceable to the analysis model which means it should satisfy all the requirements that software requires to develop a high-quality product.

3. **Should not "Reinvent The Wheel" –**
   The design process should not reinvent the wheel that means it should not waste time or effort in creating things that already exist. Due to this, the overall development will get increased.

4. **Minimize Intellectual distance –**
   The design process should reduce the gap between real-world problems and software solutions for that problem meaning it should simply minimize intellectual distance.

5. **Exhibit uniformity and integration –**
   The design should display uniformity which means it should be uniform throughout the process without any change. Integration means it should mix or combine all parts of software i.e. subsystems into one system.

6. **Accommodate change –**
   The software should be designed in such a way that it accommodates the change implying that the software should adjust to the change that is required to be done as per the user's need.

7. **Degrade gently –**
   The software should be designed in such a way that it degrades gracefully which means it should work properly even if an error occurs during the execution.

8. **Assessed or quality –**
   The design should be assessed or evaluated for the quality meaning that during the evaluation, the quality of the design needs to be checked and focused on.

9. **Review to discover errors –**
   The design should be reviewed which means that the overall evaluation should be done to check if there is any error present or if it can be minimized.

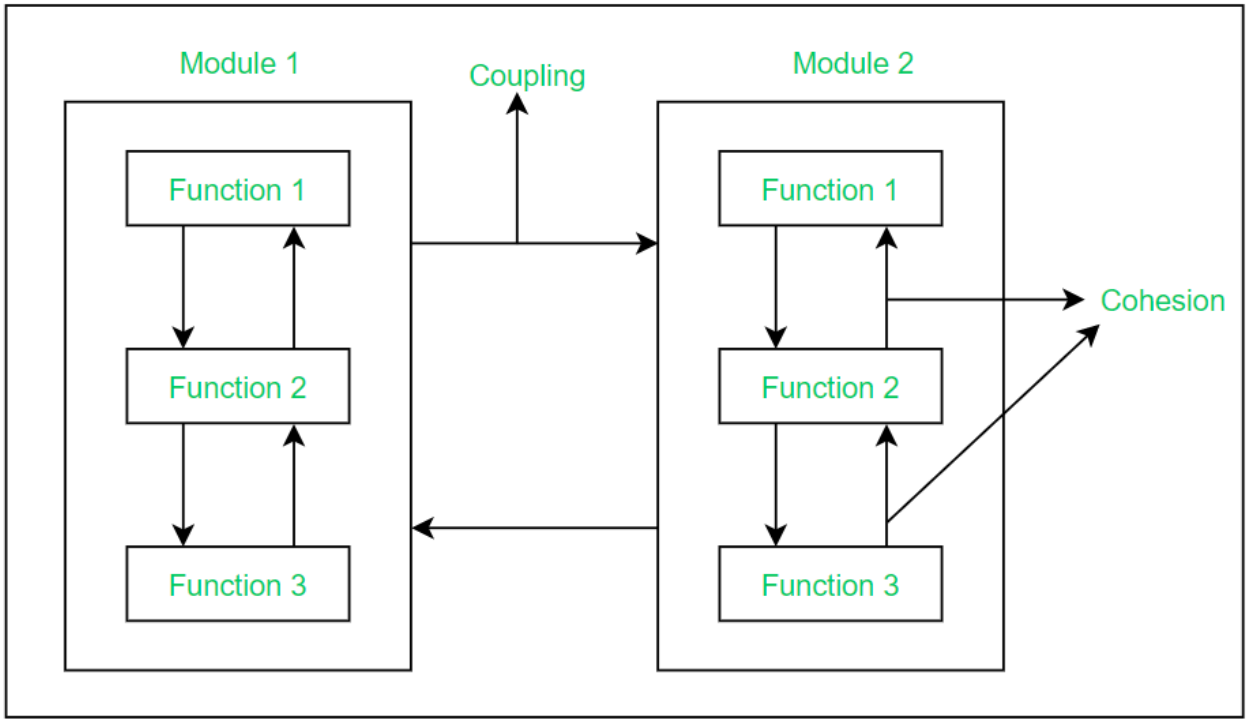
10. **Design is not coding and coding is not design –**
    Design means describing the logic of the program to solve any problem and coding is a type of language that is used for the implementation of a design.

Solution 2:

Any software comprises of many systems which contains several sub-systems and those sub-systems further contains their sub-systems. So, designing a complete system in one go comprising of each and every required functionality is a hectic work and the process can have many errors because of its vast size.

Thus in order to solve this problem the developing team breakdown the complete software into various modules. A module is defined as the unique and addressable components of the software which can be solved and modified independently without disturbing (or affecting in very small amount) other modules of the software. Thus every software design should follow modularity.

The process of breaking down a software into multiple independent modules where each module is developed separately is called **Modularization**.
Effective modular design can be achieved if the partitioned modules are separately solvable, modifiable as well as compilable. Here separate compilable modules means that after making changes in a module there is no need of recompiling the whole software system.



Cohesion:
Cohesion is a measure of strength in relationship between various functions within a module. It is of 7 types which are listed below in the order of high to low cohesion:
1. Functional cohesion
2. Sequential cohesion
3. Communicational cohesion
4. Procedural cohesion
5. Temporal cohesion
6. Logical cohesion
7. Co-incidental cohesion

Coupling:
Coupling is a measure of strength in relationship between various modules within a

software. It is of 6 types which are listed below in the order of low to high coupling:
1. Data Coupling
2. Stamp Coupling
3. Control Coupling
4. External Coupling
5. Common Coupling
6. Content Coupling

Solution 3:

The design phase of software development deals with transforming the customer requirements as described in the SRS documents into a form implementable using a programming language. The software design process can be divided into the following three levels of phases design:

- Interface Design
- Architectural Design
- Detailed Design

Software Design Document:

Software Design Document is a written document that provides a description of a software product in terms of architecture of software with various components with specified functionality.

The design specification addresses different aspects of the design model and is completed as the designer refines his representation of the software.

Importance of Design Documentation:
1**. Requirements are well understood:** With proper documentation, we can remove inconsistencies and conflicts about the requirements. Requirements are well understood by every team member.

2. **Architecture/Design of product:** Architecture/Design documents give us a complete overview of how the product look like and better insight to the customer/user about their product.
3. **New Person can also work on the project:** New person to the project can very easily understand the project through documentations and start working on it. So,

developers need to maintain the documentation and keep upgrading it according to the changes made in the product/software.
4**. Everything is well Stated:** This documentation is helpful to understand each and every working of the product. It explains each and every feature of the product/software.
5**. Proper Communication:** Through documentation, we have good communication with every member who is part of the project/software. Helpful in understanding role and contribution of each and every member.

Solution 4:

Programming style refers to the technique used in writing the source code for a computer program. Most programming styles are designed to help programmers quickly read and understands the program as well as avoid making errors. (Older programming styles also focused on conserving screen space.) A good coding style can overcome the many deficiencies of a first programming language, while poor style can defeat the intent of an excellent language.

The goal of good programming style is to provide understandable, straightforward, elegant code. The programming style used in a various program may be derived from the coding standards or code conventions of a company or other computing organization, as well as the preferences of the actual programmer.

1. Clarity and simplicity of Expression: The programs should be designed in such a manner so that the objectives of the program is clear.

2. Naming: In a program, you are required to name the module, processes, and variable, and so on. Care should be taken that the naming style should not be cryptic and non-representative.

3. Control Constructs: It is desirable that as much as a possible single entry and single exit constructs used.

4. Information hiding: The information secure in the data structures should be hidden from the rest of the system where possible. Information hiding can decrease the coupling between modules and make the system more maintainable.

5. Nesting: Deep nesting of loops and conditions greatly harm the static and dynamic behavior of a program. It also becomes difficult to understand the program logic, so it is desirable to avoid deep nesting.

6. User-defined types: Make heavy use of user-defined data types like enum, class, structure, and union. These data types make your program code easy to write and easy to understand.

7. Module size: The module size should be uniform. The size of the module should not be too big or too small. If the module size is too large, it is not generally functionally cohesive. If the module size is too small, it leads to unnecessary overheads.

8. Module Interface: A module with a complex interface should be carefully examined.

9. Side-effects: When a module is invoked, it sometimes has a side effect of modifying the program state. Such side-effect should be avoided where as possible.

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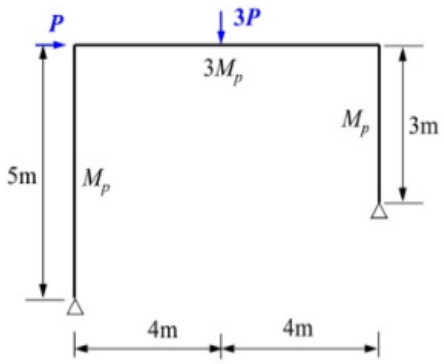
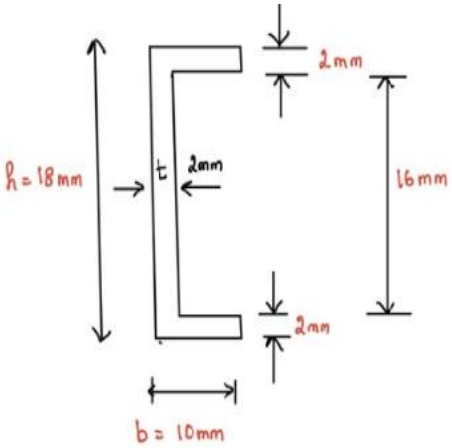
DEAPRMENT OF CIVIL ENGINEERING

Campus: PCE Course: B.TECH	Year /Semester: 3rd / 6th	Date: 02/03/2024
Name of Faculty: Balwan	Name of Lab: Design of Steel Structure	Code: 6CE4-04

Q. No	CO	BL	PO	QUESTIONS	MARKS
1	CO1	1	PO1	Explain various types of bolts used for connection.	10
2	CO2	2	PO1	Compute the true values of collapse load for the portal frame loaded as shown in fig. no. 	10
3	CO2	2	PO2	Determine the plastic and elastic section modulus and shape factor of C section as shown in fig. no. 	10

4	CO3	4	PO2	An l.S.L.C 300 @ 324.7 N/m is used to transmit a force of 575 kN. The channel section is connected to a gusset plate 12 mm thick. Design a fillet weld if the overlap is limited to 300 mm. Use slot welds if required.	15
5	CO4	4	PO11	Design a single bolted double cover butt joint to connect boiler plates of thickness 12 mm for maximum efficiency. Use 16 mm diameter bolts of grade 4.6. Boiler plates are of Fe 410 grade. Find the efficiency of the joint.	15

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Assignment (DoSS)

Q.(1) Explain various types of bolts used for connection.

Ans. 1) Carriage bolt :- Carriage bolts are used in applications where a smooth finish is required on the surface being connected. They have a smooth, rounded head and a square shank that prevents the bolts from turning when the nut is tightened.

2.) Hex bolts :- It is most common type of bolts used for various applications. They have a hexagonal head and a threaded shank that is fastened with a nut.

3.) Eye bolts :- Eye bolts are with a looped head that is used to attatch cables, ropes or chains for lifting or hanging objects. They are often used in industrial and ~~connecti~~ construction settings.

4.) Lag bolts :- It is also known as lag screws, are heavy duty bolts used for securing heavy object to wood or metal surfaces. They have a coarse thread that provides greater holding power.

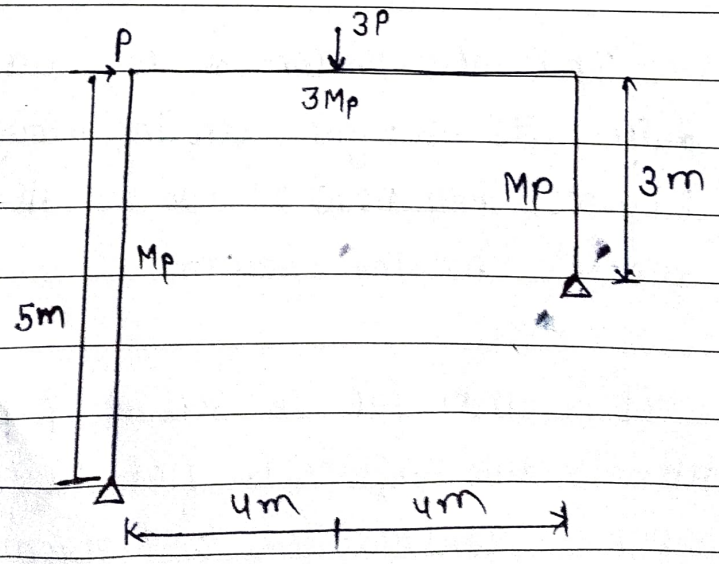
5.) U-bolts :- It is used for to secure pipes, tubing and other round objects to flat surfaces. They are commonly used in construction and automotive applications.

6.) Anchor bolts :- It is used for to secure objects to concrete or masonary surfaces. They have an L- shapped design that is embedded into the surface to provide a secure connections.

7.) Flange bolts :- Flange bolts have a washer like flange under the head that distributes the load over a wider area. This helps to prevent the bolt from loosening due to vibrations or movements.

8.) Stud bolts :- Stud bolts are threaded rods with threads on both ends that are used to connect two separate components. They are often used in conjuction with nuts to create a strong and secure connection.

8.(2) Compute the true value of collapse load for the portal frame loaded as shown in fig.



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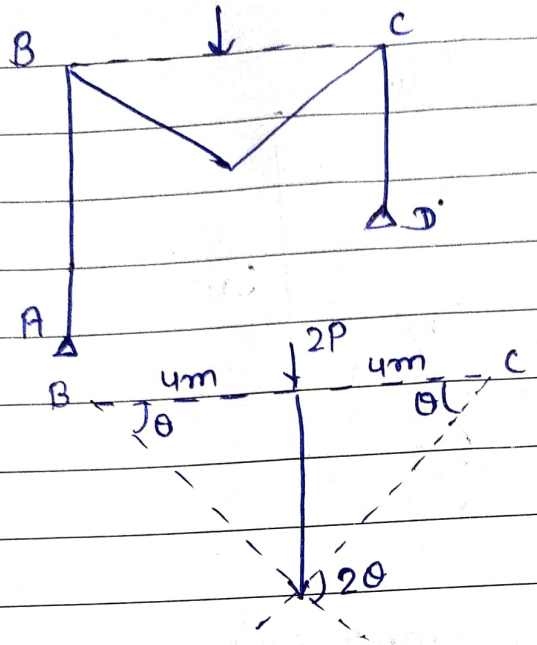
Soln:



$$\tan\theta = \frac{\alpha}{3}$$

$$\tan\theta = \theta$$

$$\theta = \frac{H}{3}$$

$$\Rightarrow H = 3\theta$$

Internal work done $= M_p\theta + 2M_p \times 2\theta + 1M_p\theta$

$= 6M_p\theta$

External work done $= 2P_c \times H = 2P_c \times 3\theta$

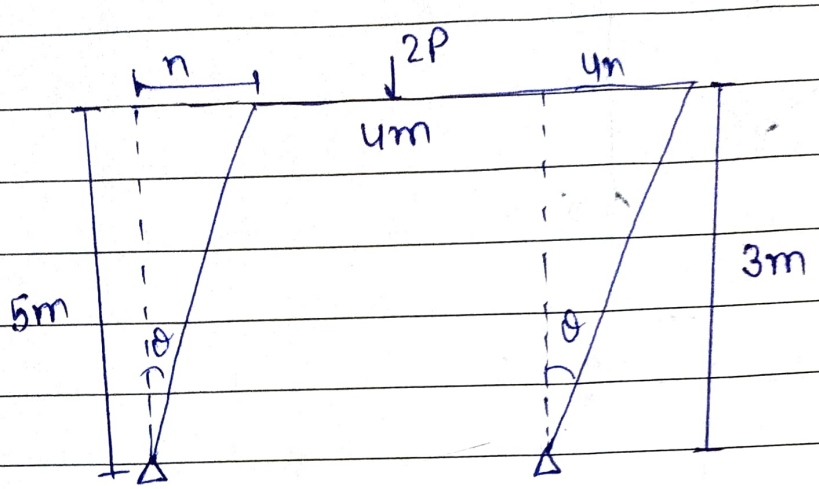
$= 6P_c\theta$

$\therefore$ Ext. = Int.

$\Rightarrow 6P_c\theta = 6M_p\theta$

$\Rightarrow P_c = M_p$

$\Rightarrow$ Stay Mechanism :-



$$\tan\theta = \frac{H}{3}$$

$$\theta = \frac{H}{5} \quad (\because \tan\theta \approx \theta)$$

$$\Rightarrow H = 5\theta$$

Internal work done = $M_p\theta + M_p\theta = 2M_p\theta$

External work done = $P \times H = P \times 5\theta = 5P\theta$

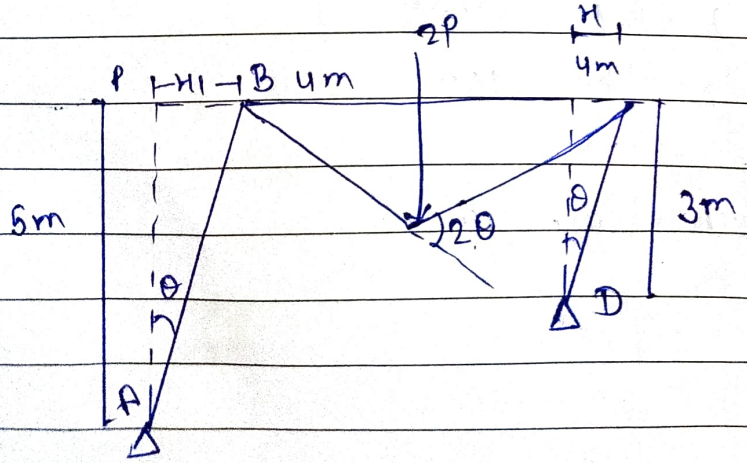
$\therefore$ Internal work done = External work done

$$\Rightarrow 2M_p\theta = 5P\theta$$

$$M_p = \frac{5P}{2} = 2.5P$$

$$\Rightarrow P = 0.4M_p$$

⇒ Combined mechanism :-



$$\tan\theta = \frac{H_1}{4}$$

$$\theta = \frac{H}{5} \quad (\because \tan\theta \simeq \theta)$$

$$\Rightarrow H_1 = 5\theta$$

$$\tan\theta = \frac{H}{4}$$

$$\theta = \frac{H}{4} \quad (\because \tan\theta \simeq \theta)$$

$$\Rightarrow H = 4\theta$$

Internal work done $= 2M_p \times 2\theta + M_p(\theta+\theta) = 6M_p\theta$

External work done $= P \times H_1 + 2P \times H$

$= P \times 5\theta + 2P \times 4\theta = 13P\theta$

$\therefore$ Internal work done = External work done

$6M_p\theta = 13P\theta$

$\Rightarrow M_p = \frac{13P}{6} \Rightarrow$

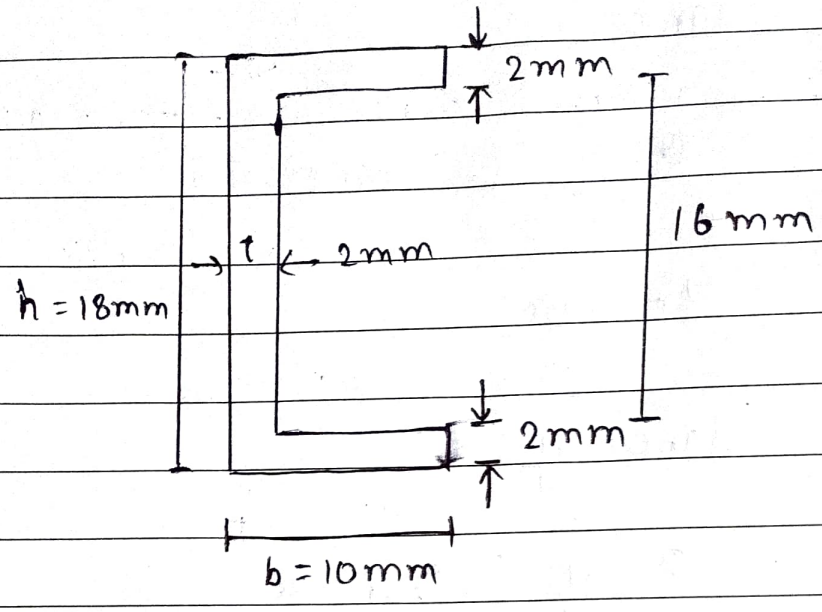
$P \Rightarrow 0.461 M_p$

$\therefore$ Combined Mechanism is the real mechanism

True collapse load =

$P = 0.4 M_p$ (minimum).

9(3) Determine the plastic and elastic section modulus and shape factor for C section as shown in fig.



Sol^n. Since X-X axis is the axis of symmetry hence it is both equal area axis & centroidal axis $\bar{y_1}$ & $\bar{y_2}$ are the distance of CG of area above and below equal area axis.

$$\bar{y_1} = \bar{y_2} = \frac{a_1y_1 + a_2y_2}{a_1 + a_2}$$

$a_1 = 10 \times 2 = 20 mm^2$

$a_2 = 8 \times 2 = 16 mm^2$

$y_1 = \frac{8}{2} = 4 mm$

$y_2 = 8 + \frac{2}{2} = 9 mm$

$\therefore \bar{y_1} = \bar{y_2} = \frac{(20 \times 4) + (16 \times 9)}{(20 + 16)}$

$= 6.22$

Area of total section $= 2 \times (10 \times 2) + (16 \times 2)$

$= 72 mm^2$

Now plastic section modulus $= \frac{A}{2}(\bar{y_1} + \bar{y_2})$

$$Zp = \frac{72}{2}(6.22 + 6.22)$$

$$Zp = 447.84 \text{ mm}^2$$

MOI of section $= \frac{BD^2}{12} - \frac{bd^2}{12}$

$$I = \frac{10 \times 20^2}{12} - \frac{8 \times 16^2}{12}$$

$$I = 3936 \text{ mm}^4$$

Distance of centroid from extreme fibr

$$y = \frac{20}{2} = 10 \text{ mm}$$

$\therefore$ Elastic module section $= \frac{I}{y}$

$$Ze = \frac{3936}{10}$$

$$Ze = 393.6 \text{ mm}^3$$

Shape factor $= \frac{Zp}{Ze}$

$$S = \frac{447.84}{393.6}$$

$$S = 1.1378$$

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Q.(4) An I.S.L.C 300 @ 324.7 N/m is used to transmit a force of 575 kN. The channel section is connected to a gusset plate 12 mm thick. Design a fillet weld if the overlap is limited to 300 mm. Use slot weld if required.

Sol.n –

Given:- fe = 410 grade
fu = 410 Mpa
γ_{mw} = 1.5
ISLC 300 @ 324.7 N/m

Ag = 4211 mm^2
tf = 11.6 mm
tw = 6.7 mm

Maximum size of weld = 6.7 - 1.5 = 5.2 mm
minimum size of weld = 5mm (for 12 mm thick plate)

Let us provide 5mm size fillet weld
effective throat thickness = KS
= 0.7 X 5
= 3.5 mm

Design of Strength of weld

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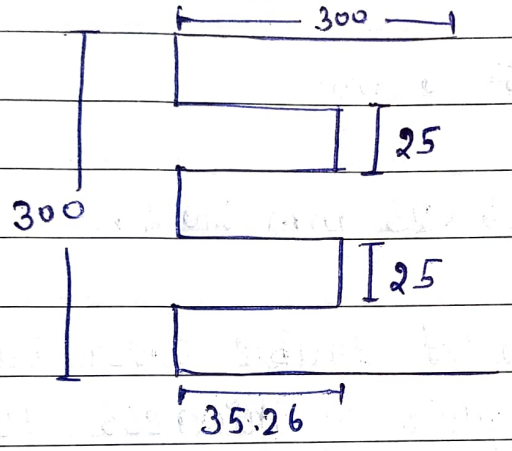
$$P_{dw} = \frac{l_w t_t \times f_u}{\sqrt{3}\,\gamma_{mw}}$$

$$= \frac{1 \times 3.5 \times 410}{\sqrt{3} \times 1.5}$$

Strength of weld = 552.33 N/m



length of weld required =

$$l_w = \frac{575 \times 10^3}{552.33} = 1041.04 \text{ mm}$$

Restriction of 300 mm overlap the length of weld that can be provided as

$$= 2 \times 300 + 300$$

$$= 900 \text{ mm} < 1041.04 \text{ mm}$$

Hence provide slot welds,
width of slot = 25 mm

(3t = 3×6.7 = 20.1 mm or 25 mm)
which is greater used as width of slot

Let us provide two slots & length of slot be l1

$$1041.04 = 2X300 + 300 + 4l_1$$

$$l_1 = 35.26 \text{ mm}$$

Now, provide 35.26 × 25 mm slots.

Q.(5) Design a single bolted double cover butt joint to connect boiler plate of thickness 12 mm for maximum efficiency. Use 16mm ~~thickness~~ dia. bolts of grade 4.6. Boiler plate are of Fe410 grade. Find the efficiency of the joint.

Sol^n -

Fe = 410
Fu = 400 mPa
d = 16 mm
du = 18 mm
Fy = 250 mpa

$$A_{nb} = \frac{\pi}{4} d^2 \times 0.78 = \pi/4 \times (16)^2 \times 0.78 = 157 mm^2$$

$\gamma_{mb} = 1.25$
$\gamma_{m1} = 1.25$

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Shear strength :-

$t = 12\ mm$

$$V_{dsb} = \frac{2 \times f_u A_{nb}}{\sqrt{3} \times \gamma_{mb}} = \frac{2 \times 400 \times 157 \times 10^{-3}}{\sqrt{3} \times 1.25}$$

$$= 58\ kN$$

Bearing strength :-

$$V_{dsb} = \frac{2.5 \times K_b\, d\, t\, f_u}{\gamma_{mb}}$$

$e = 1.5 \times d_h = 1.5 \times 18 = 30$

$p = 2.25 \times d = 36 = 50$

$$K_b = \frac{e}{3d_h} = \frac{30}{3 \times 18} = 0.55$$

$$\frac{p}{3d_h} - 0.25 = \frac{50}{3 \times 18} - 0.25 = 0.67$$

$$\frac{f_{ub}}{f_u} = 0.975$$

1

$K_b = 0.55$

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$$V_{dsb} = \frac{2.5 \times 0.55 \times 410 \times 10^{-3} \times 8 \times 16}{1.25}$$

$V_{dsb} = 57.73$ kN

Tensile strength -

$$T_{db} = \frac{0.9 f_y A_n}{\gamma_{mb}} = \frac{0.9 f_u (p - dh) t}{\gamma_{mb}}$$

$$= \frac{0.9 \times 400 \times 10^{-3} (50 - 18) \times 8}{1.25}$$

$T_{db} = 73.728$ kN

Strength of solid plate = $\frac{0.9 \times 400 \times 10^{-3} \times (50) \times 8}{1.25}$ ~~115.2~~

$= 115.2$ kN

Efficiency of joint = $\frac{\text{Strength of joint}}{\text{Strength of plate}} \times 100$

$= \frac{57.73}{115.2} \times 100$

$= 50\%$

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.

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

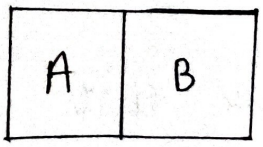
If neither mass nor energy cross the boundary of a system it is called an isolated system.

Q:- Explain the laws of thermodynamics and gas laws of thermodynamics.

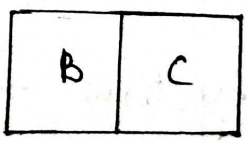
Ans Laws of thermodynamics :-

(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.

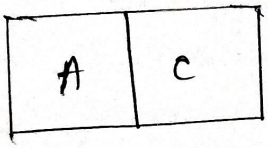


if $T_A = T_B$



& $T_B = T_C$

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

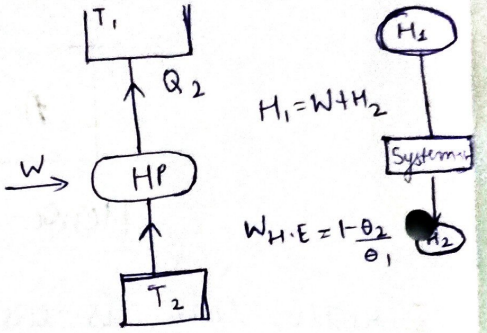
Q = Heat added to the system

W = Work done by the system.

* (iii) Second law of thermodynamics

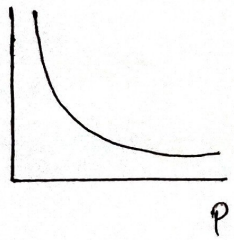
→ It is impossible to construct a device operating in a cycle where heat transfer is from cooler body to hotter body without any external work.

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.



$$V \propto \left(\frac{1}{P}\right)_{\text{constant}}$$

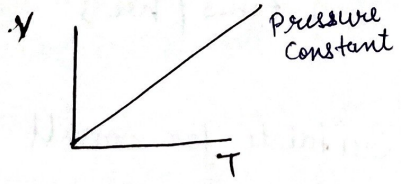
or $V = \frac{C}{P} \Rightarrow PV = C$

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

$\left(\frac{P}{T}\right) = K$

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.

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

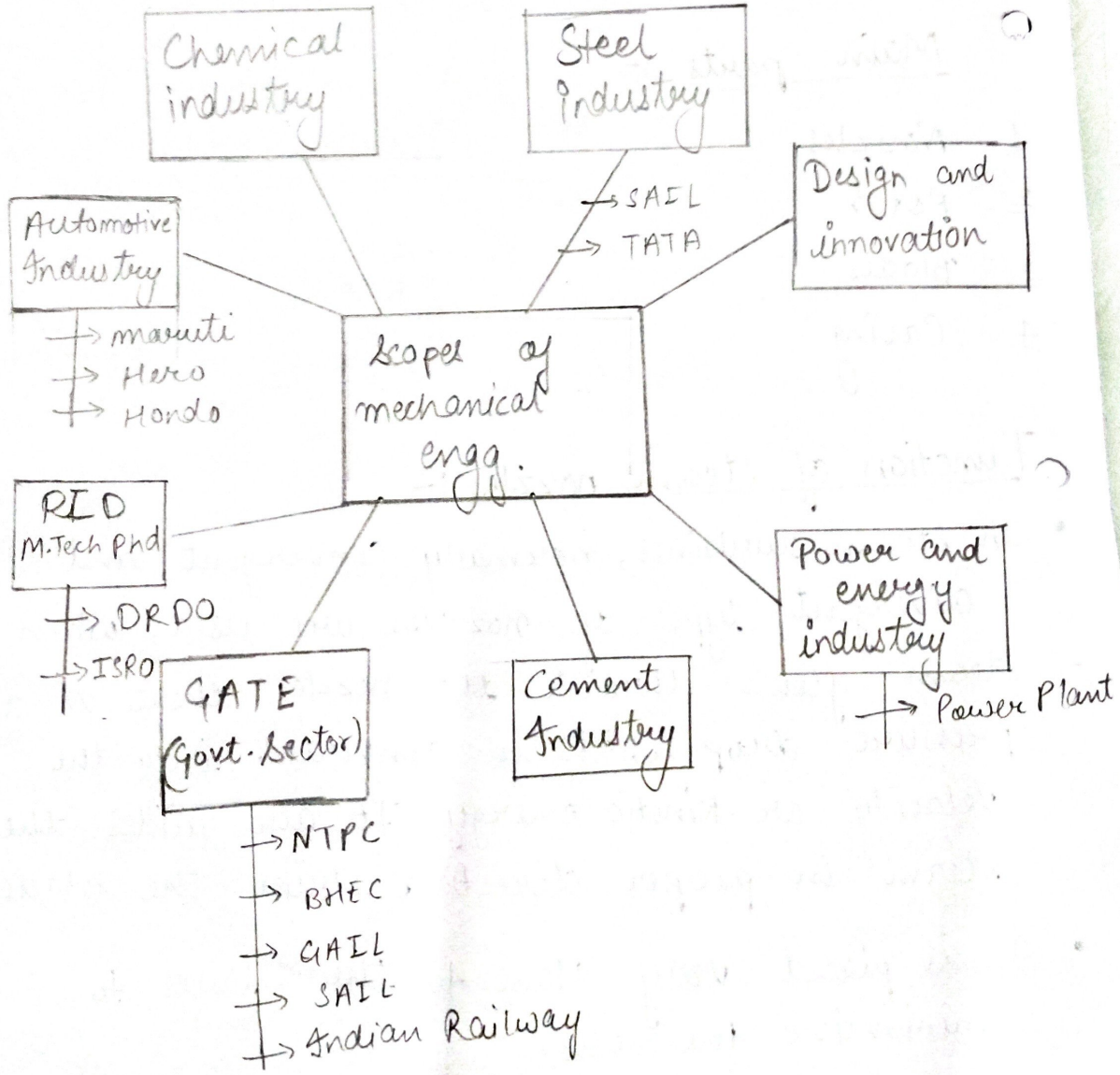
Function of steam nozzles :-

- 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.

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



Fuel & tan

Q.9 Explain the working of steam Power Plant with suitable diagram.

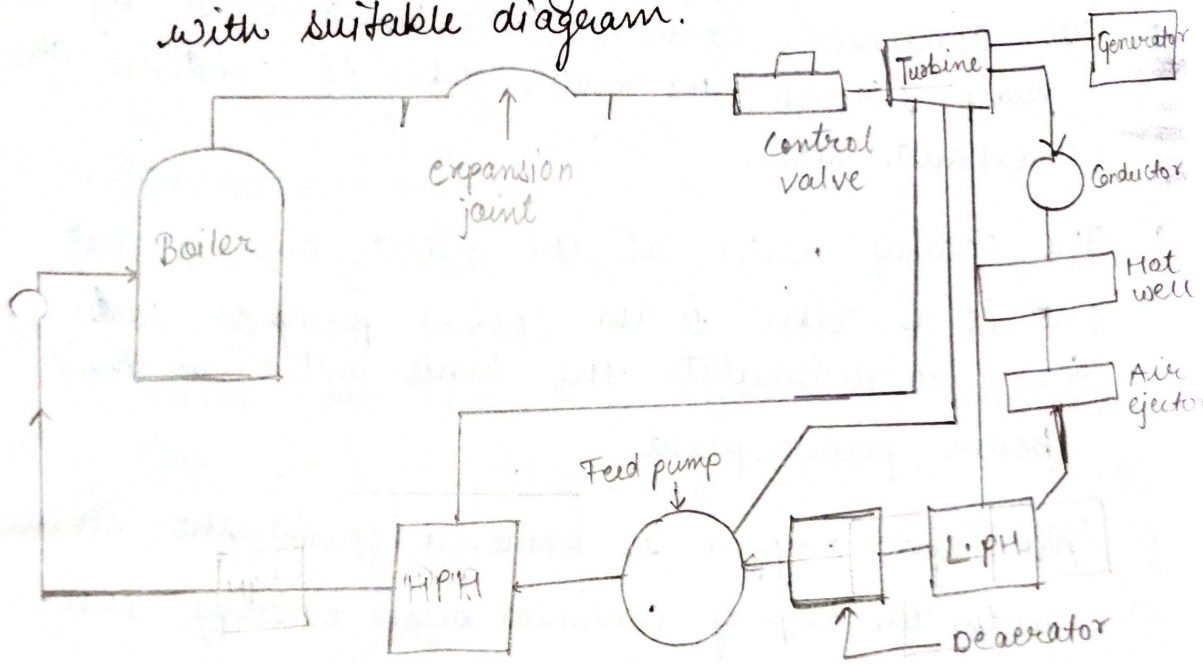


Fig :- Steam Power Plant.

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.

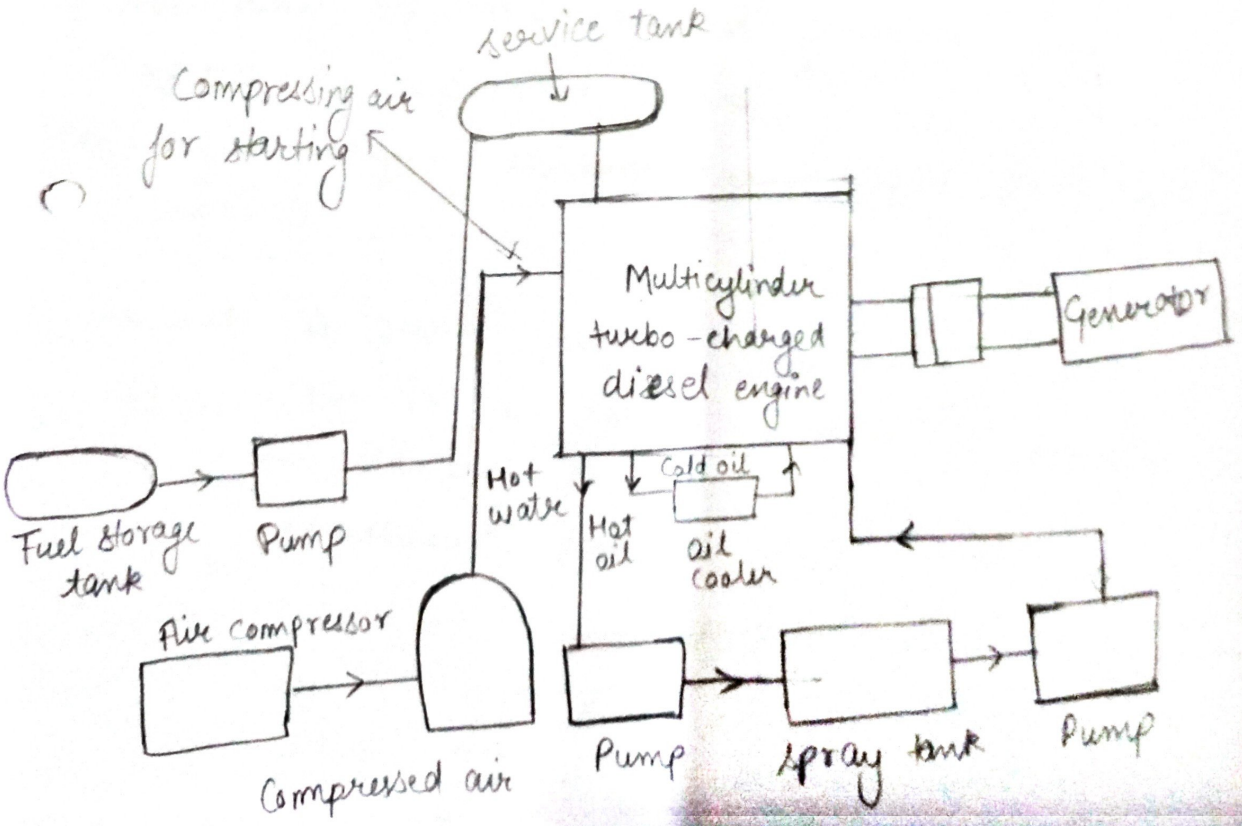
6. Air and oxygen is removed from the steam with the help of condensor before entering the boiler.

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.

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.

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.

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.

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

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.

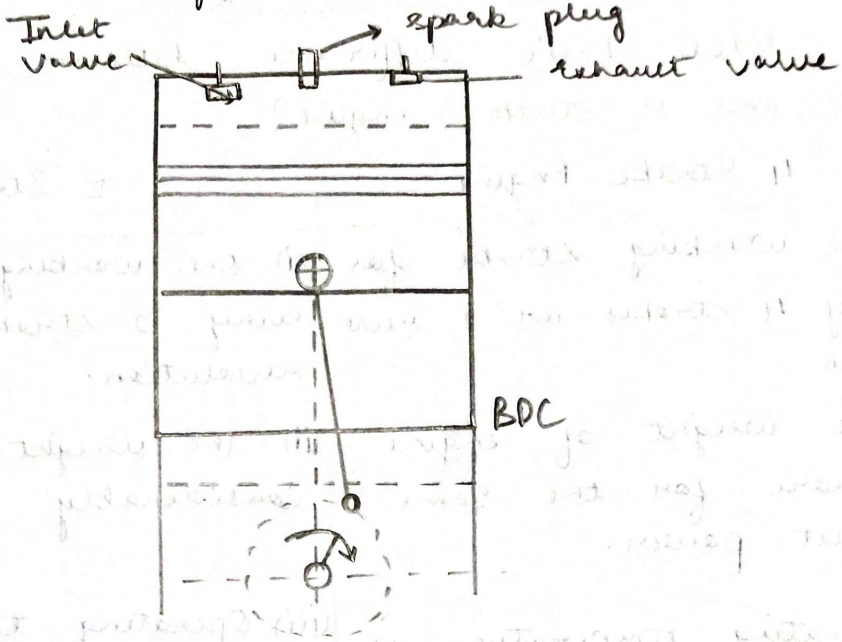
Q6: State basic difference between 2 stroke and 4 stroke engine?

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.

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

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.

(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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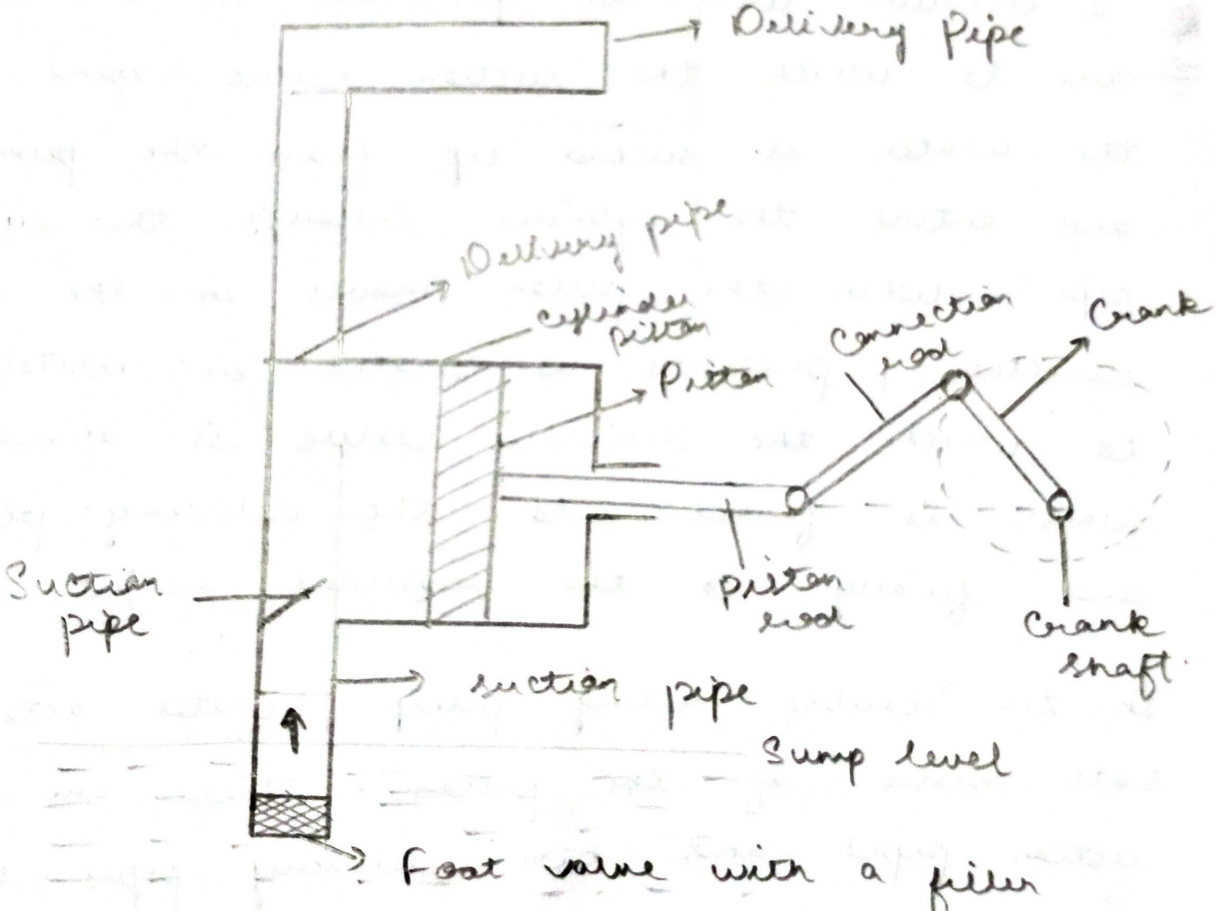
DETAILED LECTURE NOTES

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

(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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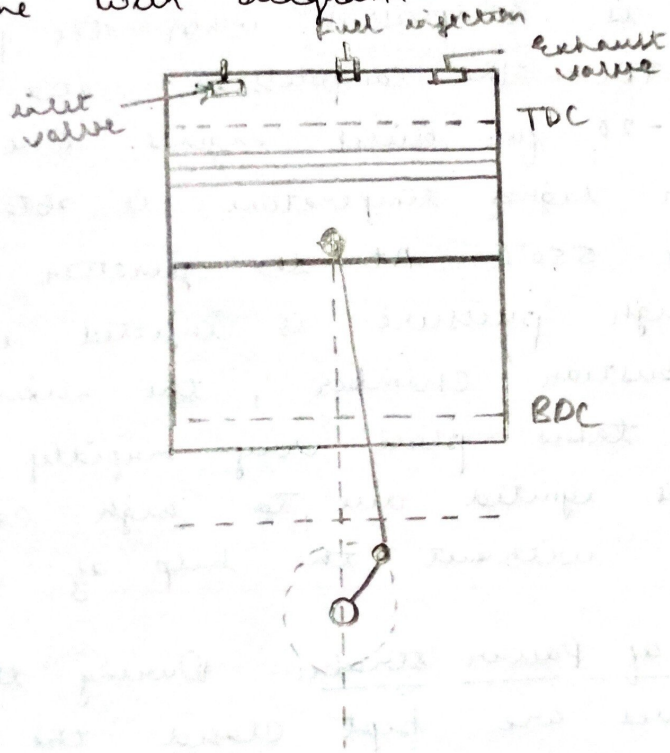
DETAILED LECTURE NOTES

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.

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

POORNIMA COLLEGE OF ENGINEERING

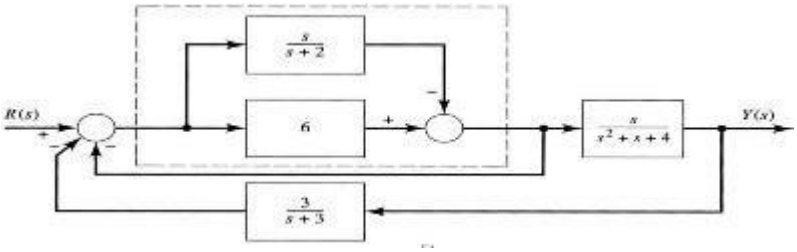
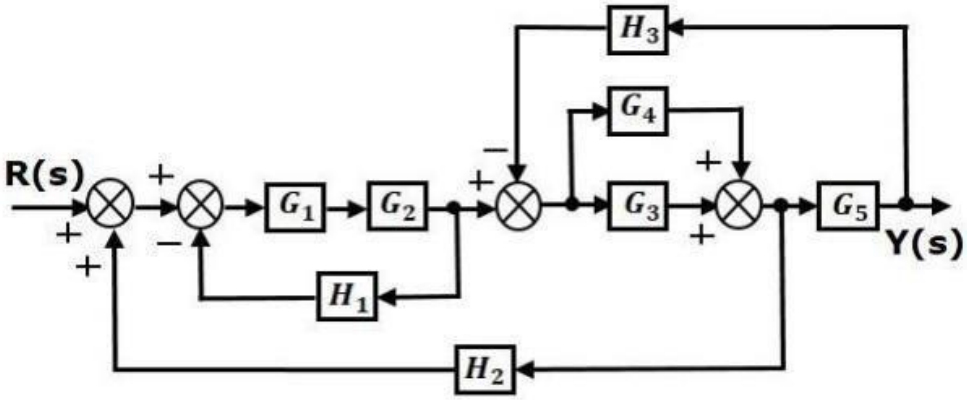
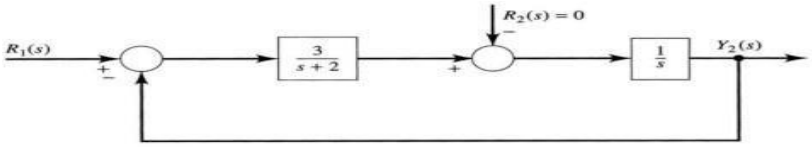
Department of Electronics & Communication Engineering

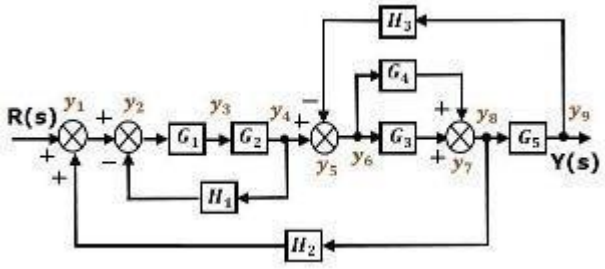
Assignment

Campus: PCE **Course: B. Tech.** **Class/Section: V Sem.** **Date: 21/11/23**

Name of Faculty: Dr. Meetu Nag **Name of Subject: Control System** **Code: 5EC4-03**

M.M. 10

1.	CO1	PO1,2,3	Q.1 Determine the transfer function.  (2)
2.	CO1	PO1,2	Q2.Consider the block diagram shown in the following figure. Let us simplify (reduce)this block diagram using the block diagram reduction rules.  (3)
3.	CO1	PO1,2	Q 3.Determine the transfer function Y2(s)/R1(s).  (3)
4.	CO1	PO1,2	Q4.Convert block diagram to signal flow graph

			 H_3 G_4 R(s) y_1 y_2 y_3 y_4 y_5 y_6 y_7 y_8 y_9 G_1 G_2 G_3 G_5 Y(s) H_4 H_2 (2)

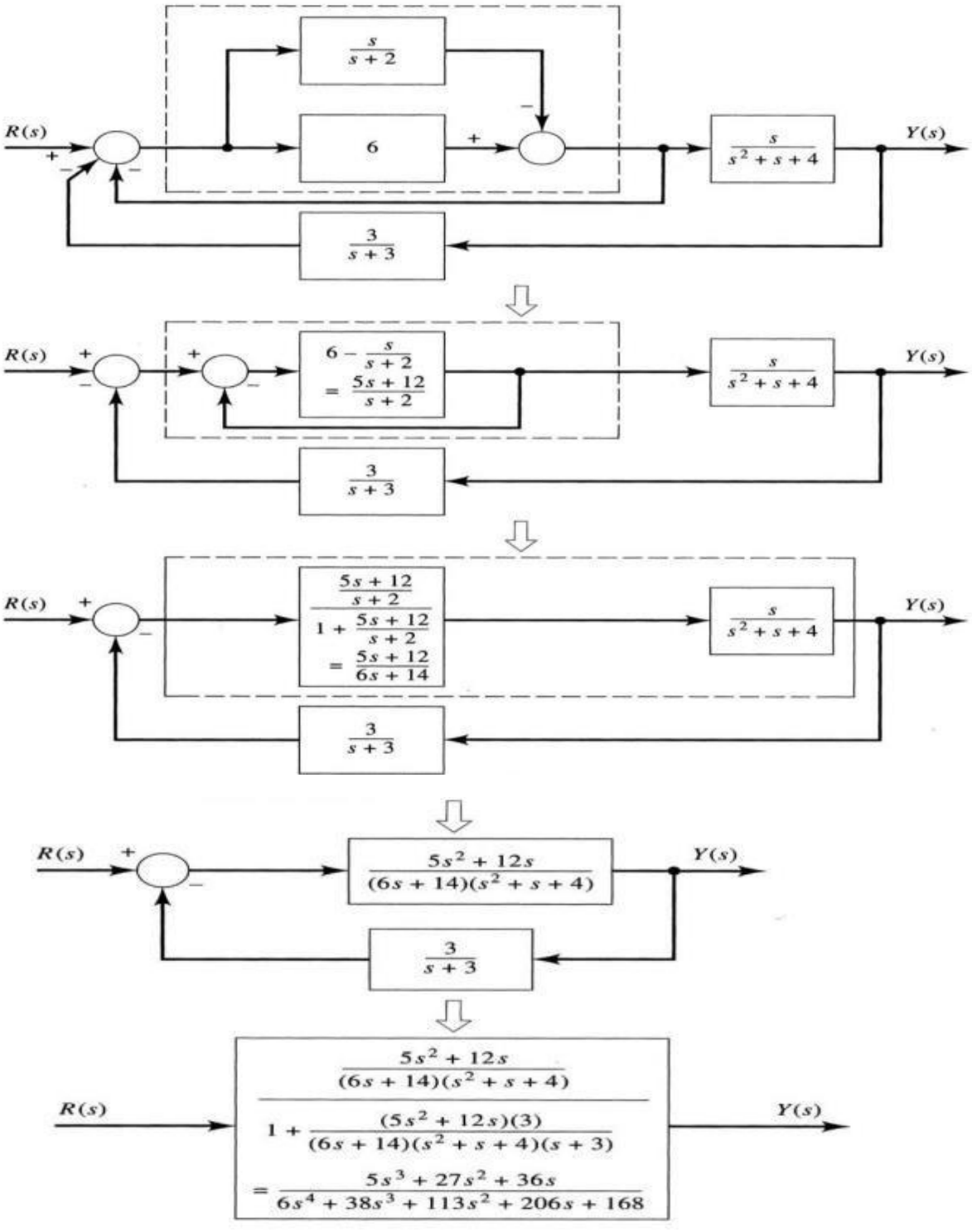
POORNIMA
COLLEGE OF ENGINEERING

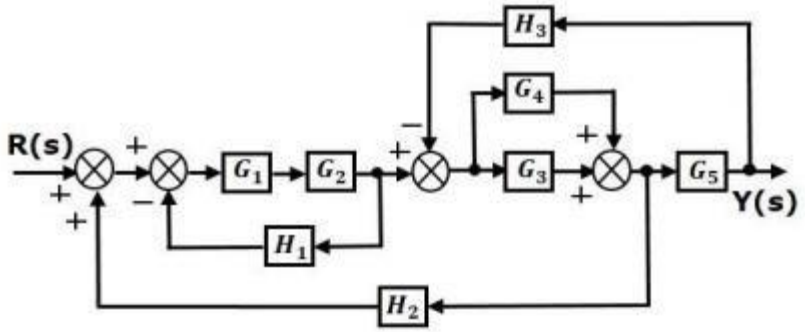
Solutions

Campus: PCE **Course: B.Tech.** **Class/Section: V Sem.** **Date: 21/11/23**

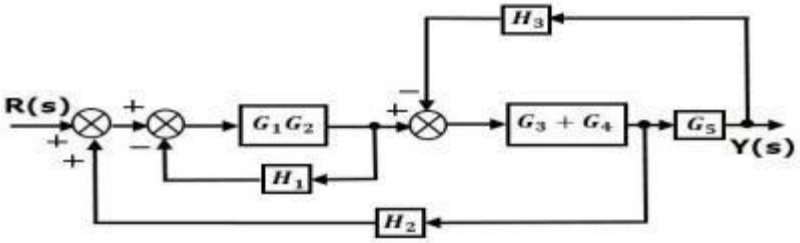
Name of Faculty: Dr. Meetu Nag **Name of Subject: Control System** **Code: 5EC4-03**

Ans 1

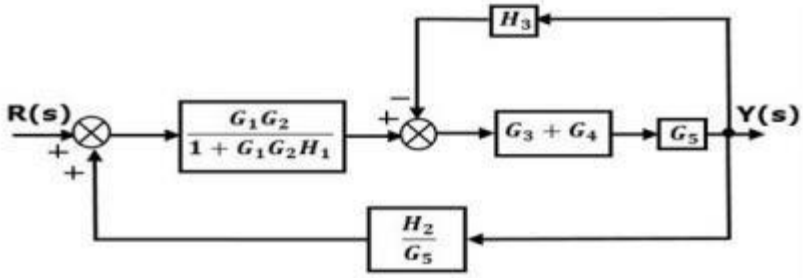




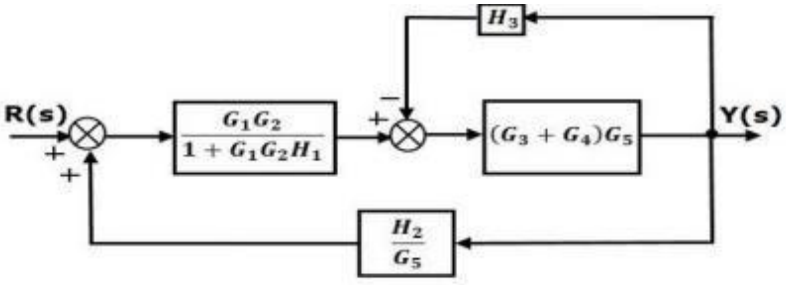
Step 1 – Use Rule 1 for blocks G_1 and G_2. Use Rule 2 for blocks G_3 and G_4. The modified block diagram is shown in the following figure.



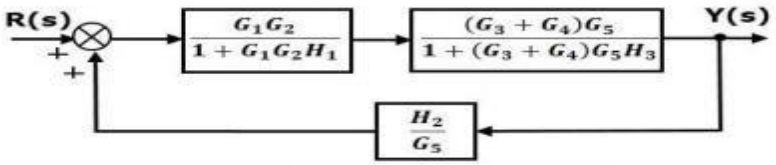
Step 2 – Use Rule 3 for blocks G_1G_2 and H_1. Use Rule 4 for shifting take-off point after the block G_5. The modified block diagram is shown in the following figure.



Step 3 – Use Rule 1 for blocks $(G_3 + G_4)$ and G_5. The modified block diagram is shown in the following figure.

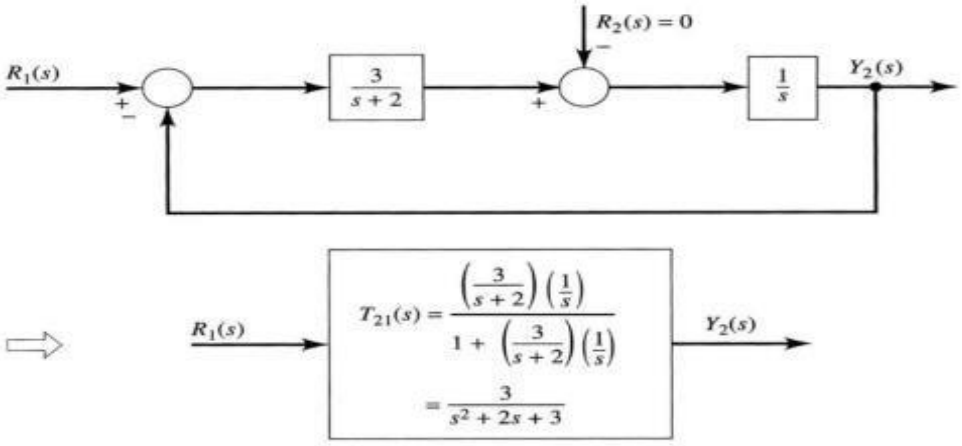


Step 4 – Use Rule 3 for blocks $(G_3 + G_4)G_5$ and H_3. The modified block diagram is shown in the following figure.

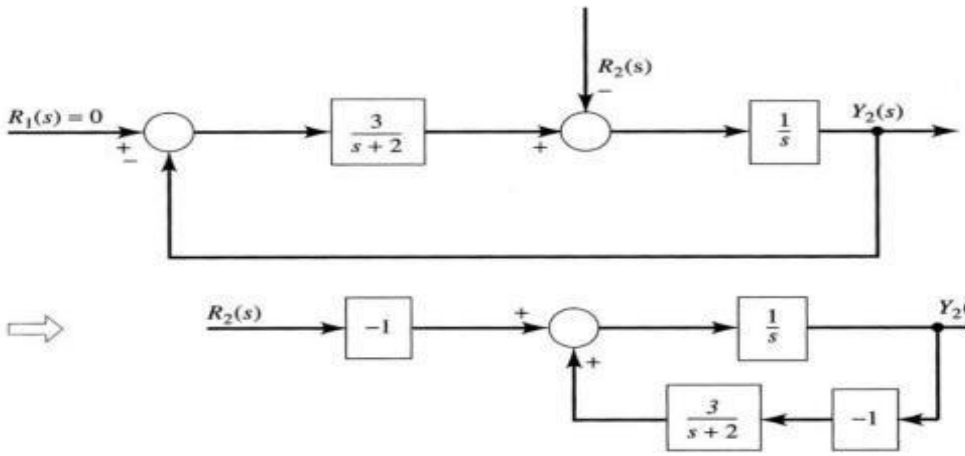


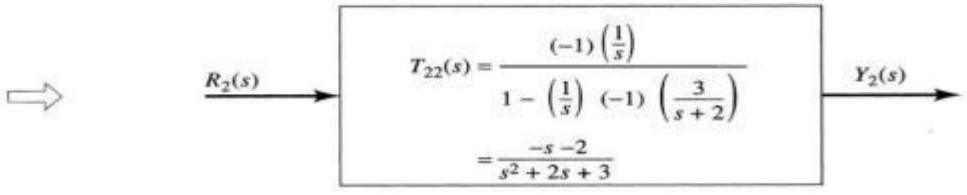
Step 5 – Use Rule 1 for blocks connected in series. The modified block diagram is shown in the following figure.

Q 1



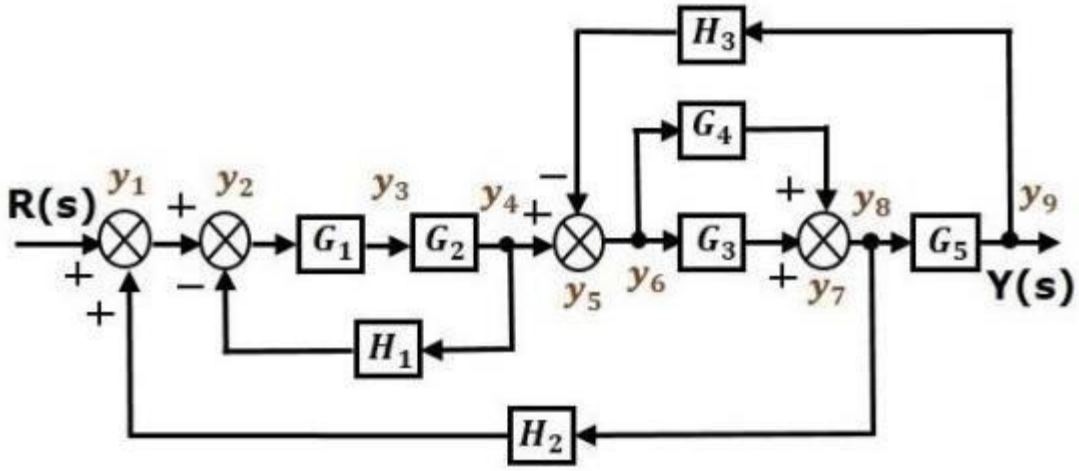
(*a*)

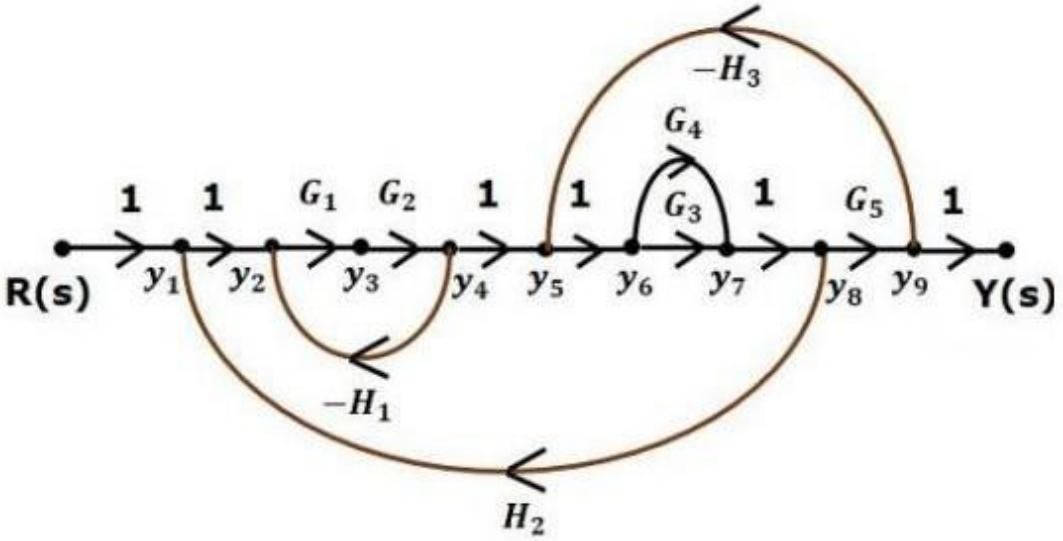




(*b*)

Q2.


H_3
G_4
R(s)
y_1
y_2
y_3
y_4
y_8
y_9
G_1
G_2
G_3
G_5
Y(s)
y_5
y_6
y_7
H_1
H_2


$-H_3$
G_4
1
1
G_1
G_2
1
1
G_3
1
G_5
1
R(s)
y_1
y_2
y_3
y_4
y_5
y_6
y_7
y_8
y_9
Y(s)
$-H_1$
H_2