POORNIMA
COLLEGE OF ENGINEERING

Course FileContent:-

S. No.	ITEM
1.	Dept Vision, Mission, PEO, PO, PSO
2.	Syllabus
3.	ABC Analysis
4.	Blown-Up
5.	Deployment
6.	Zero Lecture (Dept Vision, Mission, PEO, PO, PSO; CO+PO; CO+PSO; Target and Attainment)
7.	Detailed lecture note with cover page
8.	5 Year RTU Question Papers
9.	Tutorial Sheets / Home Assignment
10	Open Book Test Question Paper
11	Important Question Bank
12	Expert Video Lecture(In CD/Pen Drive)
13	Recording of Self Video Lecture
14	Audio Recordings of 2-lectures and 1-tutorial (if applicable)
15	Others, if any

NAME OF THE SUBJECT / LAB ....Analog Electronics........

CODE ....4EC-01A........YEAR ....2017-18........

NAME OF FACULTY ....AnuJ Bathla........

DESIGNATION ....Asst. Proff.........DEPARTMENT ....ECE........

ISI-6, RIICCO Institutional Area, Sitapura, Jaipur-302022(Rajasthan)

Telefax:+91-141-2770790,91,92

E-mail: info@poornima.org, Website: www.poornima.org

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

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Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

VISION & MISSION OF DEPARTMENT

VISION:

To establish an acknowledged department of academics in the field of Electronics and Communication Engineering.

MISSION:

To provide comprehensive technical education with the exposure of latest technology providing the learning environment for faculty members & students.

PROGRAMME EDUCATIONAL OBJECTIVES

The Department of Electronics & Communication Engineering has defined its PEOs as follows:-

PEO 1. The graduates shall be competent enough to apply current knowledge and skill to solve problems of the society.

PEO 2. The graduates shall be able to share the knowledge gained during graduation for enhancing the growth of organization.

PEO 3. The graduates shall be strong enough to face the challenges, cutthroat competition using the advanced technologies in the multifaceted forms.

PROGRAMME OUTCOMES

Programme Outcome:

a. The graduates will be proficient through the knowledge application in the fields of mathematics, science, and engineering.

b. The graduates will be proficient in designing of application, conduction of experiments and skillful to analyze and interpreting the data.

c. The graduates will be able to meet the desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability through the designing of a component, a system or process.

d. The graduates will be able to function in multidisciplinary teams.

e. The graduates will be able to identify, formulate and solve engineering problems.

f. The graduates will be made robust & susceptible enough to handle all challenges in the field of Electronics & Communication Engineering.

g. The graduates will be able to communicate their views effectively.

h. The graduates will be able to get the extensive education to understand the impact of engineering solutions in a global, economic, environmental and societal context.

i. The graduates will be able to recognize the need of engineering covering its all spheres engaging themselves in life-long learning.

j. The graduates will be able to get awareness about the contemporary issues and strive for their remedies

k. The graduates will be able to use the techniques, skills and modern engineering tools as per the need of engineering practices.

l. The graduates will be able to visualize the use of electronic design using latest products and advanced technologies to meet the various industrial requirements.

m. The graduates will be able to design systems or processes in analyzing and interpreting the system performance.

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

COURSE OBJECTIVES

1. To understand the various concept of negative feedback in amplifiers and its effect over the characteristic of amplifiers.
2. To learn the concept of positive feedback in amplifiers and it's working as an oscillator.
3. To analyze high frequency model of amplifiers.
4. To learn about the working and classification of power amplifier.

COURSE OUTCOMES

After completion of this course students will be able to

1. Know the effect of feedback in the amplifier characteristic.
2. Understand the behavior of high frequency amplifiers.
3. To calculate the various parameters of power amplifier.

Subject Name with Code	Unit Name	Objective	Outcome
Analog Electronics (4EC1A)	1.Feedback Amplifiers	Basic knowledge of feedback amplifiers and types	Implementation of feedback amplifiers
	2.Oscillators	Study of different type of oscillators	Application of oscillators in circuits
	3.High Frequency Amplifiers	Study of high frequency amplifiers and frequency analysis	Implementation of amplifier at high frequency
	4. Tuned Amplifiers	Analysis of different tuned amplifiers	Implementation of different tuned amplifier.
	5.Power Amplifiers	Study of power amplifier and different stages	Use of power amplifier for power signals.

VISION & MISSION OF THE INSTITUTION

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.

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

MAPPING OF COURSE OUTCOMES WITH PROGRAMME OUTCOMES

POs → COs ↓	a	b	c	d	e	f	g	h	i	j	k	l	m
1	√	√								√			
2	√	√								√			
3	√	√								√			

MAPPING OF COURSE OUTCOMES WITH PROGRAMME EDUCATIONAL OBJECTIVES

PEOs → COs ↓	1	2	3
1	√	√	
2	√	√	
3	√	√	

PREREQUISITE OF COURSE

Sr.No.	Name of Subject	Code
1	Electronics Devices and Circuit	3EC1A
2	Circuit Analyses and Circuit	3EC4A

MARKING SCHEME

RTU MARKS SCHEME

Maximum Marks Allocation		
Internal Exam	External Exam	Total
(40+40)/4 = 20	80	100

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

Syllabus of Poornima Group of Colleges, Jaipur

SUBJECT-ANALOG ELECTRONICS **CODE -4EC01**

Unit Name:

FEEDBACK AMPLIFIERS - Classification, Feedback concept, Feedback Topologies, Transfer gain with feedback, General characteristics of negative feedback amplifiers. Analysis of voltage-series, voltage-shunt, current-series and current-shunt feedback amplifier. Stability criterion. Compensation techniques, miller compensation.

OSCILLATORS & Multivibrators - Classification. Criterion for oscillation. Tuned collector, Hartley, Colpitts, RC Phase shift, Wien bridge and crystal oscillators, Astable, monostable and bistable multivibrators. Schmitt trigger. Blocking oscillators.

HIGH FREQUENCY AMPLIFIERS - Hybrid Pi model, Conductances and capacitances of hybrid Pi model, high frequency analysis of CE amplifier, gain bandwidth product, unity gain frequency f_T, Emitter follower at high frequencies.

TUNED AMPLIFIER - Band Pass Amplifier, Parallel resonant Circuits, Band Width of Parallel resonant circuit. Analysis of Single Tuned Amplifier, Primary & Secondary Tuned Amplifier with BJT & FET, Double Tuned Transformer Coupled Amplifier. Stagger Tuned Amplifier. Pulse Response of such Amplifier, class C tuned amplifiers, Shunt Peaked Circuits for Increased Bandwidth.

POWER AMPLIFIERS - Classification, Power transistors & power MOSFET (DMOS, VMOS). Output power, power dissipation and efficiency analysis of Class A, class B, class AB, class C, class D and class E amplifiers as output stages. Pushpull amplifiers with and without transformers, Complementary symmetry & quasi complimentary symmetry amplifiers

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

ABC ANALYSIS

CODE 4EC1

ANALOG ELECTRONICS

FEEDBACK AMPLIFIERS - Classification, Feedback concept, Feedback Topologies, Transfer gain with feedback. General characteristics of negative feedback amplifiers. Analysis of voltage-series, voltage-shunt, current-series and current-shunt feedback amplifier. Stability criterion. Compensation
techniques, miller compensation.

OSCILLATORS & Multivibrators - Classification. Criterion for oscillation. Tuned collector, Hartley, Colpitts, RC Phase shift, Wien bridge and crystal oscillators, Astable, monostable and bistable multivibrators. Schmitt trigger. Blocking oscillators.

HIGH FREQUENCY AMPLIFIERS - Hybrid Pi model, Conductances and capacitances of hybrid Pi model, high frequency analysis of CE amplifier, gain bandwidth product, unity gain frequency fT, Emitter follower at high frequencies.

TUNED AMPLIFIER - Band Pass Amplifier, Parallel resonant Circuits, Band Width of Parallel resonant circuit. Analysis of Single Tuned Amplifier, Primary & Secondary Tuned Amplifier with BJT & FET, Double Tuned Transformer Coupled Amplifier. Stagger Tuned Amplifier. Pulse Response of such Amplifier, class C tuned amplifiers, Shunt Peaked Circuits for Increased Bandwidth.

POWER AMPLIFIERS - Classification, Power transistors & power MOSFET (DMOS, VMOS). Output power, power dissipation and efficiency analysis of Class A, class B, class AB, class C, class D and class E amplifiers as output stages. Pushpull amplifiers with and without transformers, Complementary symmetry & quasi complimentary symmetry amplifiers

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

POORNIMA FOUNDATION

ABC ANALYSIS

4EE01/4EI01 ANALOG ELECTRONICS

UNIT 1 FEEDBACK AMPLIFIERS: Classification, Feedback concept, Transfer gain with feedback, General characteristics of negative feedback amplifiers, Analysis of voltage-series, voltage shunt, current series and current-shunt feedback amplifier, Stability criterion, Compensation techniques, Miller compensation

UNIT 2 OSCILLATORS: Classification, Criterion for oscillation, Tuned collector, Hartley, Colpitts, RC Phase shift, Wien Bridge and crystal oscillators, Astable, monostable and bistable multivibrators, Schmitt trigger, blocking oscillators

UNIT 3 HIGH FREQUENCY AMPLIFIERS: Hybrid Pi model, conductance and capacitances of hybrid Pi model, high frequency analysis of CE amplifier, gain-bandwidth product, Emitter follower at high frequencies

UNIT 4 TUNED AMPLIFIER: Band Pass Amplifier, Parallel resonant Circuits, Band Width of Parallel resonant circuit, Analysis of Single Tuned Amplifier, Primary & Secondary Tuned Amplifier with BJT & FET, Double Tuned Transformer Coupled Amplifier, Stagger Tuned Amplifier, Pulse Response of such Amplifier, Class C tuned amplifiers, Shunt Peaked Circuits for Increased Bandwidth

UNIT 5 POWER AMPLIFIERS: Classification, Power transistor and power MOSFET (DMOS, VMOS), Output power, Power dissipation and efficiency analysis of Class A, class B, class AB, class C, class D and class E amplifiers as output stages, push pull amplifiers with and without transformers, Complementary symmetry & quasi complimentary symmetry amplifiers

( )-Tough **( )-Medium** **( )-Easy**

ABC ANALYSIS

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

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Department of Electronics Engineering, PCE
Even Semester 2017-18

ABC Analysis

Course: B. Tech.
Name of Faculty: ANUJ BATHLA [redacted]

Class/Section: II Year B
Name of Subject: Analog Electronics

Date: 05/01/2018
Subject Code: 4EC01A

Unit No.	Category A	Category B	Category C	Preparedness for "A" topics
1	Classification, Feedback concept, Transfer gain with feedback, General characteristics of negative feedback amplifiers, Analysis of voltage-series, voltage shunt, current series and current-shunt feedback amplifier		Stability criterion, Compensation techniques, Miller compensation	Quiz
2	Astable, monostable and bistable multivibrators, Schmitt trigger, blocking ososcillators	Classification, citerion for oscillation, Tuned collector, Hartley, Colpitts, RC Phase shift, Wien Bridge and crystal oscillators		Power Point Presentation
3		Emitter follower at high Frequency	Hybrid Pi model, conductance and capacitances of hybrid Pi model, high frequency analysis of CE amplifier, gain-bandwidth product	Special Lecture
4			Band Pass Amplifier, Parallel resonant Circuits, Band Width of Parallel resonant circuit, Analysis of Single Tuned Amplifier, Primary & Secondary Tuned Amplifier with BJT FET, Double Tuned Transformer	Quiz

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

			Coupled Amplifier. Stagger Tuned Amplifier, Pulse Response of such Amplifier, Class C tuned amplifiers, Shunt Peaked Circuits for Increased Bandwidth	
5	Push pull amplifiers with and without transformers, Complementary symmetry quasi complimentary symmetry amplifiers	Classification, Power transistor and power MOSFET (DMOS, VMOS), Output power, Power dissipation and efficiency analysis of Class A, class B, class AB, class C, class D and class E amplifiers as output stages		OBT

Category:- C Easy

Category:- B Medium

Category:- A Difficult

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

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Campus: PCE	Course: B.Tech	Class/Section: 2^{nd}/B	Date: 03-01-2018
Name of Faculty: Anuj Bathla		Name of Subject: Analog Electronics	Code: 4EC01

S.No.	Topic as per Syllabus	BLOWN UP TOPICS (upto 10 Times Syllabus)
0	**Zero Lecture**	Basic introduction about subject.
1	**Unit 1 FEEDBACK AMPLIFIERS**	
	1.1 Classification	Introduction to amplifiers Types of amplifiers Voltage amplifier Current amplifier Resistance amplifier Transconductance amplifier
	1.2 Feedback concept	Definition Types of feedback Positive feedback Negative feedback Block diagram of feedback circuit Description of each block Open loop gain & close loop gain Topologies
	1.3 Transfer gain with feedback	1.3.4.1 Voltage series 1.3.4.2 Voltage shunt 1.3.4.3 Current series 1.3.4.4 Current shunt
	1.4 General characteristics of negative feedback amplifiers	1.4.1 Advantages of negative feedback 1.4.1.1 Stabilization of gain 1.4.1.2 Reduction in nonlinear distortion 1.4.1.3 Reduction in noise 1.4.1.4 Reduction in lower cutoff frequency 1.4.1.5 Increase in upper cutoff frequency 1.4.1.6 Increase in bandwidth 1.4.2 Disadvantages of negative feedback 1.4.2.1 Reduction in gain 1.4.3 Effect of feedback on impedances 1.4.3.1 Voltage series 1.4.3.1 Voltage shunt 1.4.3.1 Current series 1.4.3.1 Current shunt

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

	1.5 Analysis of Voltage series feedback Amplifier Using BJT	1.5.1 Circuit Diagram 1.5.2Analysis 1.5.3 Numerical
	1.6 Analysis of Voltage series feedback Amplifier Using FET	1.6.1 Circuit Diagram 1.6.2Analysis 1.6.3 Numerical
	1.7 Analysis of Current series feedback Amplifier Using BJT	1.7.1 Circuit Diagram 1.7.2Analysis 1.7.3 Numerical
	1.8 Analysis of Current series feedback Amplifier Using FET	1.8.1 Circuit Diagram 1.8.2Analysis 1.8.3 Numerical
	1.9 Analysis of Voltage Shunt feedback Amplifier Using BJT	1.9.1 Circuit Diagram 1.9.2Analysis 1.9.3 Numerical
	1.10 Analysis of Current Shunt feedback Amplifier Using BJT	1.10.1 Circuit Diagram 1.10.2Analysis 1.10.3 Numerical
	1.11Stability Criterion	1.11.1 Nyquist stability criterion 1.11.2 Nyquist plot
	1.12 Compensation Techniques	1.12.1 Theorem 1.12.2 Diagram 1.12.3 Numerical
	1.13 Miller Compensation	1.13.1 Theorem 1.13.2 Diagram 1.13.3 Numerical
	Unit 2: Oscillators	
	2.1 Classification	2.1.1 Introduction 2.1.2 Oscillatory(tank) circuit 2.1.3 Positive feedback 2.1.4 Gain of oscillator 2.1.5 Classification of oscillators 2.1.5.1 According to frequency band 2.1.5.2 According to waveform of signal generated 2.1.5.3 According to Components
	2.2 Criterion For Oscillation	2.2.1 Types of oscillation 2.2.2 Barkhausen criterion of oscillation
	2.3 Tuned collector oscillator	2.3.1 Circuit diagram 2.3.2 Working 2.3.3Mathematical analysis

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

	2.4 Hartley oscillator	2.4.1 Circuit diagram 2.4.2 Working 2.4.3 Mathematical analysis 2.4.4 Numerical
	2.5Colpitts oscillator	2.5.1 Circuit diagram 2.5.2 Working 2.5.3 Mathematical analysis 2.5.4 Numerical
	2.6 Phase shift oscillator	2.6.1 Circuit diagram 2.6.2 Working 2.6.3 Mathematical analysis 2.6.4 Numerical
	2.7 Wein bridge oscillator	2.7.1 Circuit diagram 2.7.2 Working 2.7.3 Mathematical analysis 2.7.4 Numerical
	2.8 Crystal oscillator	2.8.1 Circuit diagram 2.8.2 Working 2.8.3 Mathematical analysis 2.8.4 Numerical
	2.9Astablemultivibrator	2.9.1 Circuit diagram 2.9.2 Working 2.9.3 Waveform 2.9.4 Numerical
	2.10Monostablemultivibrator	2.10.1 Circuit diagram 2.10.2 Working 2.10.3 Waveform
	2.11Bistablemultivibrator	2.11.1 Circuit diagram 2.11.2 Working 2.11.3 Waveform
	2.12 Schmitt Trigger	2.12.1 Circuit diagram 2.12.2 Working 2.12.3 Waveform 2.12.4 Numerical
	2.13 Blocking Oscillator	2.13.1 Circuit diagram 2.13.2 Working 2.13.3 Waveform
	Unit 3: High Frequency Amplifier	
	3.1 Hybrid Pi Model	3.1.1 Proof 3.1.2 Introduction to element of model

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
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	3.2 Conductance & capacitance of hybrid pi model	3.2.1 Conductance 3.2.2 Capacitance
	3.3 High Frequency Analysis of CE Amplifier	3.3.1 Mathematical analysis 3.3.3.1 CE short circuit current gain 3.3.3.2 CE current gain with resistive load
	3.4 Gain bandwidth product	3.4.1 Mathematical analysis
	3.5 Emitter Follower At High Frequencies	3.5.1 Circuit diagram 3.5.2 Analysis
	UNIT4 : Tuned Amplifier	
	4.1 Band Pass Amplifier	4.1.1 Resonance 4.1.2 Selectivity 4.1.3 Q factor
	4.2 Parallel Resonant Circuits	4.2.1 Selectivity 4.2.2 Q factor 4.2.3 Impedance 4.2.4 Bandwidth
	4.3 Analysis of Single Tuned Amplifier	4.3.1 Circuit diagram 4.3.2 Mathematical analysis 4.3.3 Frequency response
	4.4 Primary & secondary Tuned amplifier With BJT & FET	4.4.1 Circuit diagram using FET & BJT 4.4.2 Mathematical analysis 4.4.3 Frequency response
	4.5 Analysis of Double Tuned Transformer Coupled Amplifier	4.5.1 Circuit diagram 4.5.2 Mathematical analysis 4.5.3 Pulse response
	4.6 Stagger Tuned Amplifier	4.6.1 Concept of staggering 4.6.2 Need of staggering 4.6.1 Circuit diagram 4.6.2 Mathematical analysis 4.6.3 Frequency response
	4.7 Shunt Peaked Circuit	4.7.1 Circuit diagram 4.7.2Working
	4.8 Advantages & Disadvantages of Tuned Amplifier	4.8.1 Advantages of tuned amplifier 4.8.2 Disadvantages of tuned amplifier
	UNIT 5: POWER AMPLIFIERS	
	5.1 Classification of Power Amplifiers	5.1.1 Class A amplifier 5.1.2 Class B amplifier
	5.2 Power Transistor	5.1.3 Class C amplifier 5.1.4 Class D amplifier

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
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		5.2.1 Circuit diagram 5.2.2Working
	5.3 Power MOSFET	5.3.1 Circuit diagram 5.3.2Working
	5.4Analysis of Class A Amplifier	5.4.1 Series fed 5.4.1.1 DC power input 5.4.1.2 AC power output 5.4.1.3 Efficiency 5.4.1.4 Power dissipation 5.4.1.5 Advantages & disadvantages 5.4.2 Transformer coupled 5.4.2.1 Circuit diagram 5.4.2.2 DC power input 5.4.2.3 AC power output 5.4.2.4 Efficiency 5.4.2.5 Power dissipation 5.4.2.6 Advantages & disadvantages 5.4.3Harmonic distortion 5.4.1.1 Second Harmonic distortion 5.4.1.2 Power output due to distortion 5.4.4 Numerical
	5.5Analysis of Class B Amplifier	5.5.1 Circuit diagram 5.5.2 Operating Cycle 5.5.3 Waveform
	5.6Analysis of Class AB Amplifier	5.6.1 Circuit diagram 5.6.2 Operating Cycle 5.6.3 Waveform
	5.7Analysis of Class C Amplifier	5.7.1 Circuit diagram 5.7.2 Operating Cycle 5.7.3 Waveform
	5.8Analysis of Class D Amplifier	5.8.1 Circuit diagram 5.8.2 Operating Cycle 5.8.3 Waveform
	5.9Analysis of Class E Amplifier	5.9.1 Circuit diagram 5.9.2 Operating Cycle 5.9.3 Waveform
	5.10Push Pull Amplifiers With & Without Transformers	5.10.1 Class A Push Pull Amplifier 5.10.1.1 Circuit Diagram 5.10.1.2 Operation 5.10.1.3 Mathematical Analysis 5.10.1.4Waveform 5.10.1.5 Numerical 5.10.2 Transformer Less Push Pull Amplifier 5.10.2.1 Circuit Diagram

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

		5.10.2.2 Operation 5.10.2.3 Mathematical Analysis 5.10.2.4Waveform 5.10.2.5 Numerical
	5.11 Complementary symmetry & Quasi Complementary Symmetry Amplifier	5.11.1 Complementary Symmetry Amplifier 5.11.1.1 Circuit Diagram 5.11.1.2 Operation 5.11.2 Quasi Complementary Symmetry Amplifier 5.11.2.1 Circuit Diagram 5.11.2.2 Operation
	5.12 Comparison	5.12.1 Comparison between voltage & power amplifier

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

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Campus: PCE Course: B.Tech.	Class/Section: 2nd/B	Date: 03/01/18
Name of Faculty: Anuj bathla	Name of Subject: Analog Electronics	Code: 4EC1A

S.No.	TOPIC AS PER BLOWNUP SYLLABUS	LECT. NO.	PLANNED DATE	ACTUAL DEL. DATE	REASON FOR DEVIATION	REF. / TEXT BOOK WITH PAGE NO.
	Introduction Basic introduction about subject. 0.2 Relevance to Branch 0.3 Relevance to Society 0.4 Relevance to Self 0.5 Relation with laboratory 0.6 Connection with previous and next year **Conclusion** **Unit 1: FEEDBACK AMPLIFIERS**	L0	1/1/18	2/1/18		www.wikipedia.org
	Introduction *Classification* Introduction to amplifiers Types of amplifiers Voltage amplifier Current amplifier Resistance amplifier Transconductance amplifier **Conclusion**	L1	3/1/18	3/1/18		T1JBG; T2SG; R3
	Introduction *Feedback concept* Definition Types of feedback Positive feedback Negative feedback	L2	8/1/18	9/1/18		T1JBG; T2SG; R3

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
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	Transfer gain with Feedback Block diagram of feedback circuit Description of each block Open loop gain & close loop gain **Conclusion**	L3	9/1/18	10/1/18		T1JBG; T2SG; R3
	Introduction Topologies 1.3.4.1 Voltage series 1.3.4.2 Voltage shunt 1.3.4.3 Current series 1.3.4.4 Current shunt **Conclusion**	L4	10/1/18	11/1/18		T1JBG; T2SG; R3
	Introduction General characteristics of negative feedback amplifiers 1.4.1 Advantages of negative feedback 1.4.1.1 Stabilization of gain 1.4.1.2 Reduction in nonlinear distortion	L5	15/1/18	16/1/18		T1JBG; T2SG; R3
	1.4.1.3 Reduction in noise 1.4.1.4 Reduction in lower cutoff frequency 1.4.1.5 Increase in upper cutoff frequency 1.4.1.6 Increase in bandwidth **Conclusion**	L6	16/1/18	17/1/18		T1JBG; T2SG; R3
	Introduction 1.4.2 Disadvantages of negative feedback 1.4.2.1 Reduction in gain 1.4.3 Effect of feedback on impedances	L7	22/1/18	23/1/18		T1JBG; T2SG; R3
	1.4.3.1 Voltage series 1.4.3.2 Voltage shunt 1.4.3.3 Current series 1.4.3.4 Current shunt 1.5.1 Rules to find the input & output circuit **Conclusion**	L8				T1JBG; T2SG
	Introduction 1.5.2 Analysis of :		29/1/18	30/1/18		T1JBG(383);

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

	1.5.2.1 Voltage series 1.5.2.2 Voltage shunt 1.5.2.3 Current series 1.5.2.4 Current shunt **Conclusion**	L9	5/2/18	6/2/18		T2SG(12.1 2);
	Introduction Stability criterion 1.6.1 Nyquist stability criterion 1.6.2 Nyquist plot **Conclusion**	L10	8/2/18	9/2/18		T1JBG; T2SG
	Unit 2 : OSCILLATORS **Introduction** 2.1.1 Oscillatory (tank) circuit 2.1.2 Positive feedback 2.1.3 Gain of oscillator 2.1.4 Classification of oscillators 2.1.4.1 According to frequency 2.1.4.2 According to principle used 2.1.4.3 According to waveform of signal generated According to reactive elements used. **Conclusion**	L11	10/2/18	19/02/18	on leaves	T1JBG; T2SG R3(339)
	Introduction *Criterion for oscillation* 2.2.1 Types of oscillation 2.2.2 Barkhausen criterion of oscillation 2.3.1 Tuned collector oscillator 2.3.1.1 Circuit diagram 2.3.1.2 Working 2.3.1.3 Mathematical analysis **Conclusion**	L12	19/2/18	20/02/18		T1JBG; T2SG R3(342)
	Introduction 2.3.2 Hartley oscillator 2.3.2.1 Circuit diagram 2.3.2.2 Working 2.3.2.3 Mathematical analysis 2.3.3 Colpitts oscillator	L13	20/2/18	22/02/18		T1JBG(421); T2SG(14.8); R3(344)

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
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	2.3.3.1 Circuit diagram 2.3.3.2 Working 2.3.3.3 Mathematical analysis **Conclusion**				
	Introduction 2.3.4 Phase shift oscillator 2.3.4.1 Circuit diagram 2.3.4.2 Working 2.3.4.3 Mathematical analysis	L14	22/2/18	23/02/18		T1JBG; T2SG R3(346)
	2.3.5 Wein bridge oscillator 2.3.5.1 Circuit diagram 2.3.5.2 Working 2.3.5.3 Mathematical analysis 2.3.6 Crystal oscillator 2.3.6.1 Circuit diagram 2.3.6.2 Working 2.3.6.3 Mathematical analysis **Conclusion**	L15	24/2/18	26/2/18		T1JBG; T2SG
	Introduction Multivibrator 2.4.1 Concept 2.4.2 Types of states 2.4.3 Classification 2.4.4 Astable multivibrator 2.4.4.1 Circuit diagram 2.4.4.2 Working 2.4.4.3 Waveform **Conclusion**	L16	5/3/18	5/3/18		T1JBG; T2SG R3(351)
	Introduction 2.4.5 Monostable multivibrator 2.4.5.1 Circuit diagram 2.4.5.2 Working 2.4.5.3 Waveform	L17	7/3/18	7/3/18		T1JBG; T2SG R3(424)
	2.4.6 Bistable multivibrator 2.4.6.1 Circuit diagram 2.4.6.2 Working 2.4.6.3 Waveform **Conclusion**	L18	9/3/18	9/3/18	I MID Term	T1JBG; T2SG R3(425)
	Introduction 2.5 Schmitt trigger 2.5.1 Circuit diagram	L19	19/3/18	20/3/18		T1JBG;

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	2.5.2 Working 2.5.3 Waveform					T2SG R3(427)
	2.6 Blocking Oscillator 2.6.1 Circuit diagram 2.6.2 Working 2.6.3 Waveform **Conclusion**	L20	21/3/18	22/3/18		T1JBG; T2SG R3(429)
	First mid term					
	Discussion of first mid term Question paper	L21	23/3/18	23/3/18		T1JBG; T2SG
	Unit 3: High Frequency Amplifier					
	Introduction Hybrid Pi model 3.1.1 Proof 3.1.2 Introduction to element of model	L22	26/3/18	27/3/18		T1JBG; T2SG
	3.1.3 Conductance & capacitance of hybrid pi model **Conclusion**	L23	29/3/18	29/3/18		T1JBG; T2SG
	Introduction High Frequency Analysis Of CE Amplifier 3.2.1 Hybrid pi model 3.2.2 Conductance and capacitances 3.2.3 Mathematical analysis 3.2.3.1 CE short circuit current gain 3.2.3.2 CE current gain with resistive load 3.2.4 Gain bandwidth product **Conclusion**	L24	30/3/18	29/3/18		T1JBG; T2SG
	SPL					
	Introduction Emitter follower at high frequencies 3.3.1 Circuit diagram 3.3.2 Analysis **Conclusion**	L25	2/4/18	3/4/18		T1JBG; T2SG
						T1JBG;

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

	Revision Class **OBT**	L26 L27	4/4/18	4/4/18		T2SG R3(369)
	UNIT 4: TUNED AMPLIFIER **Introduction** Resonance *Series resonant circuit* 4.2.1 Selectivity 4.2.2 Q factor **Conclusion**	L28	5/4/18	5/4/18		T1JBG; T2SG
	Introduction *Parallel resonant Circuits* 4.3.1 Selectivity 4.3.2 Q factor 4.3.3 Impedance 4.3.4 Bandwidth **Conclusion**	L29	9/4/18	9/04/18		T1JBG; T2SG R3(302)
	Introduction Classification Of Tuned Amplifier 4.4.1 Small signal tuned amplifier 4.4.1.1 Single tuned 4.4.1.2 Double tuned 4.4.1.3 Stagger tuned	L30	10/4/18	10/4/18		T1JBG; T2SG
	4.4.2 Large signal tuned amplifier **Conclusion**	L31	11/4/18	11/4/18		
	Introduction Analysis Of Single Tuned Amplifier 4.5.1 Circuit diagram using FET and BJT 4.5.2 Mathematical analysis 4.5.3 Frequency response **Conclusion**	L32	13/4/18	13/4/18		T1JBG; T2SG
	Introduction Analysis Of Double Tuned Amplifier 4.6.1 Circuit diagram 4.6.2 Mathematical analysis 4.6.3 Frequency response	L33	13/4/18	14/4/18		T1JBG; T2SG

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
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	Conclusion					
	Introduction Stagger Tuned Amplifier 4.7.1 Concept of staggering 4.7.2 Need of staggering 4.7.3 Circuit diagram 4.7.4 Mathematical analysis **Conclusion** **Introduction** Shunt Peaked Circuit 4.8.1 Circuit diagram 4.8.2 Mathematical analysis 4.8.3 Frequency response **Conclusion**	L34	14/4/18	16/4/18		T1JBG; T2SG
	Introduction 4.9.1 Advantages of tuned amplifier 4.9.2 Disadvantages of tuned amplifier **Conclusion** **Revision Class** **Surprise Test of Unit 4**	L35	17/4/18	19/4/18		T1JBG; T2SG
	UNIT 5: POWER AMPLIFIERS	L36	21/4/18	23/4/18		T1JBG; T2SG
	Introduction Introduction to power amplifier Classification Of Power Amplifiers 5.2.1 Class A amplifier 5.2.2 Class B amplifier 5.2.3 Class C amplifier 5.2.4 Class D amplifier **Conclusion**	L37	24/4/18	24/4/18		T1JBG; T2SG
	Introduction Analysis of class A amplifier 5.3.1 Series fed 5.3.1.1 DC power input 5.3.1.2 AC power output 5.3.1.3 Efficiency 5.3.1.4 Power dissipation 5.3.1.5 Advantages and disadvantages	L38 L39	24/4/18 25/4/18	25/4/18 26/4/18		T1JBG; T2SG

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

	Conclusion					
	Introduction 5.3.2 Transformer coupled 5.3.2.1 Circuit diagram 5.3.2.2 DC power input 5.3.2.3 AC power output 5.3.2.4 Efficiency 5.3.2.5 Power dissipation 5.3.2.6 Advantages and disadvantages **Conclusion**	L40	28/4/18	28/4/18		T1JBG; T2SG
	Introduction Harmonic Distortion In Power Amplifiers 5.4.1 Second harmonic distortion 5.4.2 Power output due to distortion **Conclusion**	L41	30/4/18	30/4/18		T1JBG; T2SG
	Introduction Class A Push Pull Amplifier 5.5.1 Circuit diagram 5.5.2 Operation 5.5.3 Advantages and disadvantages **Conclusion**					
	Introduction Class B Push Pull Amplifier 5.6.1 Circuit diagram	L42	1/5/18	1/5/18		T1JBG; T2SG
	5.6.2 Operation 5.6.3 Advantages and disadvantages **Conclusion**	L43	3/5/18	3/5/18		
	Quiz	L44	5/5/18	7/5/18		T1JBG; T2SG
	Introduction Transformer Less Class B Amplifiers (Complementary Symmetry) 5.7.1 Circuit diagram	L45	7/5/18	7/5/18		T1JBG; T2SG
	5.7.2 Operation 5.7.3 Advantages and disadvantages **Conclusion**	L46	7/5/18	7/5/18		T1JBG; T2SG

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
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	Introduction Complementary Symmetry Class B Push Pull Amplifier	L47	8/5/18	9/5/18		T1JBG; T2SG
	5.8.1 Circuit diagram 5.8.2 Operation 5.8.3 Advantages and disadvantages **Conclusion**	L48	9/5/18	9/5/18		T1JBG; T2SG
	Introduction Crossover Distortion 5.9.1 Description 5.9.2 Remedy	L49	10/5/18	10/5/18		T1JBG; T2SG
	Comparison 5.10.1 Comparison between voltage and power amplifier **Conclusion**	L50	11/5/18	11/5/18		T1JBG; T2SG
	Revision Class 1(1st & 2nd unit)	L51	12/5/18	12/5/18		T1JBG; T2SG
	Revision class 2(3rd 4th 5th unit)	L52	12/5/18	12/5/18		T1JBG; T2SG
	Solving Important Question's					
	Analysis of Last years RTU paper's					

References:-

1) **Integrated Electronics :Analog and Digital Circuits an system by Millman & Halkias (R1)**

2) **Electronics devices an Circuits by J.B.Gupta (T1)**

3) **Electronics devices an Circuits by Sanjeev Gupta (T2)**

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

POORNIMA
COLLEGE OF ENGINEERING

Session: 2017 -18 (Even Sem.)

COURSE: B.TECH
NAME OF FACULTY: Anuj bathla

CLASS/SECTION: IV/[redacted],B YEAR (Sem.)
Branch: Electronics & Communication Engineering

Zero Lecture

Name of Subject with Code : Analog electronics (4EC01)
Course Nature (Compulsory/Elective) : Compulsory

2). Self-Introduction:

a). Name: Anuj Bathla
b). Qualification: B.Tech, M.Tech
c). Designation: Assistant Professor
d). Research Area: *Semiconductor nanomaterial*
e). E-mail Id: anuj.bathla@poornima.org
f). Other details:

1. Areas of proficiency/expertise:
   - 1.1 Subjects taken:
     - 1.1.1 Engineering Physics
     - 1.1.2 Analog electronics
     - 1.1.3 Optical fiber communication
     - 1.1.4 Industrial electronics
   - 1.2 Laboratories Taken:
     - 1.2.1 Industrial electronics Lab
   - 1.3 Member of Professional Body: None
   - 1.4 Academic Proficiency:
     - 1.4.1 English
     - 1.4.2 Hindi
   - 1.5 Book Authored: None
   - 1.7 Papers published in National/ International Conferences/ Journals

2.6.1. **Anuj Bathla**, Chetna Narula, R.P.Chauhan"Synthesis and Characterization of Silica Nanowires Using Rice Husk" presented in National Conference on Nano science and Instrumentation Technology (NCNIT-2017) organised by Department of Physics, NIT Kurukshetra, Haryana, India. [Best poster award]

2.6.2. **Anuj Bathla**, Chetna Narula, R.P Chauhan "Hydrothermal Synthesis and Characterization of Silica Nanowires Using Rice Husk Ash: An Agricultural Waste" presented in NANO INDIA 2017 Conference organized by IIT Delhi, New Delhi.

2.6.3. **Anuj Bathla**, Chetna Narula, R.P Chauhan "Hydrothermal Synthesis and Characterization of Silica Nanowires Using Rice Husk Ash: An Agricultural Waste" published in SCI Journal "Journal of materials science: Material in electronics" (JMSE-Springer) [Impact factor 2.019]

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

3) **Introduction of Students:**

a) *Records of students in 12th*

S. No.	Average result of 12th	Name of student scored highest marks	Marks 60% above (No. of students)	Marks between 40%-60% (No. of students)	English Medium Students (No.)	Hindi Medium Students (No.)	No. of Hostellers	No. of Day Scholar

b). Name of 05 best students based on previous results

Vision and Mission of Department

Vision

To establish an acknowledged department of academics in the field of Electronics and Communication Engineering

Mission

To provide comprehensive technical education with the exposure of latest technology providing the learning environment for faculty members & students

4) Department Programme Educational Objectives (PEOs)

The Programme Educational Objectives of the Department of Electronics & Communication Engineering have been defined as follows:-

PEO 1. The graduates shall be competent enough to apply current knowledge and skills to solve several problems of the society.

PEO 2. The graduates shall be able to share the knowledge gained during graduation for enhancing the growth of organization.

PEO 3. The graduates shall be strong enough to face the challenges, cutthroat competition using the advanced technologies in the multifaceted forms.

Department Programme Outcomes (POs)

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 analyse 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 prediction and modelling 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 the need for sustainable development.

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

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

Program Educational Objectives (PEOs):

The Department of Electronics & Communication Engineering has defined its PEOs as follows:-

PEO 1. The graduates shall be competent enough to apply current knowledge and skill to solve problems of the society.
PEO 2. The graduates shall be able to share the knowledge gained during graduation for enhancing the growth of organization.
PEO 3. The graduates shall be strong enough to face the challenges, cutthroat competition using the advanced technologies in the multifaceted forms.

Program Outcomes (POs):

a. The graduates will be proficient through the knowledge application in the fields of mathematics, science, and engineering.
b.The graduates will be proficient in designing of application, conduction of experiments and skillful to analyze and interpreting the data.
c. The graduates will be able to meet the desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability through the designing of a component, a system or process.
d.The graduates will be able to function in multidisciplinary teams.
e. The graduates will be able to identify, formulate and solve engineering problems.
f. The graduates will be made robust & susceptible enough to handle all challenges in the field of Electronics & Communication Engineering.
g.The graduates will be able to communicate their views effectively.
h.The graduates will be able to get the extensive education to understand the impact of engineering solutions in a global, economic, environmental and societal context.
i. The graduates will be able to recognize the need of engineering covering its all spheres engaging themselves in life-long learning.
j. The graduates will be able to get awareness about the contemporary issues and strive for their remedies
k.The graduates will be able to use the techniques, skills and modern engineering tools as per the need of engineering practices.
l. The graduates will be able to visualize the use of electronics design using latest products and advanced technologies to meet the various industrial requirements.
m. The graduates will be able to design systems or processes in analyzing and interpreting the system performance.

4). Instructional Language: - 100% English

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
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5). Introduction to subject: -

a). Relevance to Branch:
Electronics & Communication branch deals with use of electronic circuitry in communication System which uses many different kind of electronic devices i.e analog and digital. So this Subject tells us about analog electronic devices, their construction, working and application.

b). Relevance to Society:
In our daily needs we confront with many electronic devices of analog nature like amplifiers Signal generators, and many others. So this subject helps us to get in the depth of their working. And this innovation will help in bringing a tremendous change in the society.
c). Relevance to Self:

This subject moves us to the depth of knowledge. If one is interested in the practical applications then this is useful like in further studies, in projects. As this subject brushes up the thinking power so we come up to the most optimum utilization of the things and subjects.

***d)* Pre- Requisites (Connection with previous year): -**
1. Electronics' Device & Circuit (3EC1A)
2. Analog Electronics (4EC1A)

As in previous semester, the concepts learnt in Electronics Devices and Circuit was related to build the basics of the students. They understood how to solve any complex circuit and simplify them and get the same results as that of the complex one. Students will be able to understand electronic circuits and how they can be designed with components such as operational amplifiers and transistors, tuned amplifier also able to individually dimension, simulate, build and test Low Frequency and High Frequency. This subject is the basic building block of electrical engineering enabling students in easy grasping of various electronics concepts.
g). Connection with Poornima Mission for becoming English Proficient Institution (PMEPI):
Improving in presentation skill
h) Significance of Gate:
Some topics are related to analog electronics circuits.

e) Course Outcome:
1. Able to understand analog electronic circuits and how they can be designed with components such as operational amplifiers and transistors, tuned amplifier. Able to use network techniques to write equations for large linear circuits.
2. Able to analyze circuits containing ideal operational amplifiers.
3. The student will be able to individually dimension, simulate, build and test Low Frequency and High Frequency.
4. Able to analyze simple two-port circuit.

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

Course Objectives-

1. To provide the students with knowledge and the basic understanding of properties and characteristics of amplifiers.
2. Gain knowledge of fundamentals,advantages and advances in feedback amplifier.
3. Knowledge of working and analysis of amplifiers and important two port circuit.

4.Configuration and architecture of for large linear circuits.

6). Syllabus of RTU

4EC1A ANALOG COMMUNICATION

UNIT 1 **FEEDBACK AMPLIFIERS:**

Classification, Feedback concept, Transfer gain with feedback, General characteristics of negative feedback amplifiers, Analysis of voltage-series, voltage shunt, current series and current-shunt feedback amplifier, Stability criterion, Compensation techniques, Miller compensation

UNIT 2 **OSCILLATORS& Multivibrator**

Classification, Criterion for oscillation, Tuned collector, Hartley, Colpitts, RC Phase shift, Wien Bridge and crystal oscillators, Astable, monostable and bistable multivibrators, Schmitt trigger, blocking oscillators

UNIT 3 **HIGH FREQUENCY AMPLIFIERS**

Hybrid Pi model, conductance and capacitances of hybrid Pi model, high frequency analysis of CE amplifier, gain-bandwidth product, Emitter follower at high frequencies

UNIT 4 **TUNED AMPLIFIER**

Band Pass Amplifier, Parallel resonant Circuits, Band Width of Parallel resonant circuit, Analysis of Single Tuned Amplifier, Primary & Secondary Tuned Amplifier with BJT & FET, Double Tuned Transformer Coupled Amplifier, Stagger Tuned Amplifier, Pulse Response of such Amplifier, Class C tuned amplifiers, Shunt Peaked Circuits for Increased Bandwidth

UNIT 5 **POWER AMPLIFIERS**

Classification, Power transistor and power MOSFET (DMOS, VMOS), Output power, Power dissipation and efficiency analysis of Class A, class B, class AB, class C, class D and class E amplifiers as output stages, push pull amplifiers with and without transformers, Complementary symmetry & quasi complimentary symmetry amplifiers b). **ABC analysis (RGB method) of unit & topics:**

UNIT 1: FEEDBACK AMPLIFIERS : Classification, Feedback concept, Transfer gain with feedback, General characteristics of negative feedback amplifiers, Analysis of voltage-series, voltage-shunt, current series and current-shunt feedback amplifier, Stability criterion, Compensation techniques, Miller compensation

UNIT 2: OSCILLATORS: Classification, Criterion for oscillation, Tuned collector, Hartley, Colpitts, RC Phase shift, Wien bridge and crystal oscillators, Astable, monostable and bistable multivibrators, Schmitt trigger, Blocking oscillators

UNIT 3: HIGH FREQUENCY AMPLIFIERS: Hybrid Pi model, conductance and capacitances of hybrid Pi model, high frequency analysis of CE amplifier, gain-bandwidth product, Emitter follower at high frequencies

UNIT 4: TUNED AMPLIFIER: Band Pass Amplifier, Parallel resonant Circuits, Band Width of Parallel resonant circuit, Analysis of Single Tuned Amplifier, Primary & Secondary Tuned Amplifier with BJT & FET, Double Tuned Transformer Coupled Amplifier, Stagger Tuned Amplifier, Pulse Response of such Amplifier, Shunt Peaked Circuits for Increased Bandwidth

UNIT 5: POWER AMPLIFIERS: Classification, Power transistor and power MOSFET (DMOS, VMOS), Output power, Power dissipation and efficiency analysis of Class A, class B, class AB, class C, class D and class E amplifiers as output stages, push pull amplifiers with and without transformers, Complementary symmetry & quasi complimentary symmetry amplifiers

GREEN: Hard

RED : Moderate

BLUE : Easy

10). Books/ Website/Journals & Handbooks/ Association & Institution:

a). Recommended Text & Reference Books and Websites:

S. No.	Title of the book	Author	Publication	Remark (Text/ Reference)	No. Book Available in Library
1	T1	Electronic Devices & Circuits	J.B. Gupta	S.K Kataria & Sons	495

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Director
Poornima College of Engineering
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2	T2	Electronic Devices & Circuits	Sanjeev Gupta	Dhanpat Rai & Co.	350
3	R1	Electronic Devices & Circuits	Milliman & Halkias	T.M.H	275
4	R2	Electronic Devices & Circuits	Boylstead	PHL	475
5	R3	Electronic Devices & Circuits	S.K Sahdev	Dhanpat Rai	275

b). Journals & Handbooks: - To give information about different Journals & Handbooks available in library related to the subject and branch.

1. Journal of Scientific and Industrial Research
2. Indian Journal of Engineering and Material Science
3. Institute of Engineers
4. IEEE Communication magazine

c). Associations and Institutions: -To give information about different Associations and Institutions related to the subject and branch.

1. Department Of Science and Technology(DST)
2. IEEE
3. IETE
4. BARC
5. DRDO
6. MNIT & IIT

d). ***Websites related to subject:-***

1. www. nptel.iitm.ac.in
2. www.4shared.com
3. www.mit.com
4. www.google.com

11). Syllabus Deployment: -

a). Total weeks available for academics (excluding exams/ holidays) as per PGC calendar-

SEMESTER	IV
No. of Working Days Available (Approx.)	73
No. of Weeks(Approx.)	12

- Total weeks available for covering RTU syllabus- 10-11 weeks (Approx.)
- Total weeks available for special activities (as mentioned below)- 02 weeks (Approx.)

b). Course Assesment Methods (Special Activities):

(To be approved by HOD, Dean & Campus Director & must be mentioned in deployment):

- Open Book Test- Once in a semester
- Quiz (50% Technical & 50% Aptitude)- Once in a semester
- Special Lectures (SPL)- 10% of total no. of lectures including following
  i. One PPT by the faculty, who is teaching the subject
  ii. SPL by expert faculty at PGC level
  iii. SPL by expert from industry/academia (other institution)
- Revision classes:- 1 to 3 turn at the end of semester (Before II Mid Term Exam)

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

- Solving Important Question Bank- 1 Turn before I & II Mid Term Exam (each) - Total Two turn.
- I and II Midterms
- RTU University Examinations

c). Lecture schedule per week/ Contact Hours:

i). University scheme (L+T+P) = 3+1+0

ii). PGC scheme (L+T+P) = 3+1+0

Sr. No.	Name of Unit	No. of lectures	Broad Area	Degree of difficulty (High/Medium/Low)	No. of Question in RTU	Text/ Reference books
FEEDBACK AMPLIFIERS	12	Voltage Series & shunt,	High	2	Milman & Halkias,	FEEDBACK AMPLIFIERS
OSCILLATORS	12	Hartley, Colpitts, Tuned,	Medium	2	Milman & Halkias/	OSCILLATORS
HIGH FREQUENCY	05	Hybrid-pi model	High	2	Milman &	HIGH FREQUENCY
4.	TUNED AMPLIFIER	07	Analysis of Single Tuned	Medium	2	J. B. Gupta
5.	POWER AMPLIFIERS	10	Push- pull amplifier, Class-A, B, C amplifier	Low	2	Milman & Halkias

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.

12) Mapping with PEOs , POs and Course Outcome

S.no	Course Outcome	PEO1	PEO2	PEO3	PEO4	a	b	c	d	e	f	g	H	i
1	Able to understand analog electronic circuits and how they can be designed with components such as operational amplifiers and transistors, tuned amplifier.	S	W	M	W	W	S	M	S	W	M	W	M	S

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

12). **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

I[st] 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).

II[nd] 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)

III[rd] 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 with in specified due date.

Part (ii) other important questions, which may also be solved and submitted for examining and guidance by teacher.

13). 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	40	40%	70% theory + 30% numerical	60%	PGC
2.	IInd Mid Term Exam	40	40%	90% Theory + 10% Numerical	40%	PGC
3.	University (End) Term Exam	80	30%	80% theory + 20 % numerical	FULL	RTU

14). CO-PO Mapping

Example-

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
1	2	2	3	3	3	2	2	2	2	3	1	1
2	2	2	3	3	3	3	1	3	3	3	2	1
3	2	1	3	3	3	2	1	2	3	3	3	1
4	1	1	3	3	3	2	2	2	1	2	2	1
5	2	1	3	3	3	3	3	2	1	2	2	1

Example-

CO	**PSO1**	**PSO2**	**PSO3**
1	3	3	1
2	3	3	1
3	3	3	1
4	3	3	1
5	3	3	1

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

Target and Attainment of the subject during the session (2016-17)

Name of the Subject	Target (2016-17)	Attainment (2016-17)

Place & Date: Jaipur, 02/01/18

Name & Signature of Faculty
Anuj Bathla

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

POORNIMA
COLLEGE OF ENGINEERING

LECTURE NOTES

Unit-I (Lec-1)

Campus: PCE Course: B.Tech Class/Section: III yr B Date: ....
Name of Faculty: Anuj Bathla Name of Subject: Analog electronics Code: 4EC01
Date (Prep.): .... Date (Del.): .... Unit No.: 2 Lect. No: 1

OBJECTIVE: To be written before taking the lecture (Pl. write in bullet points the main topics/concepts etc., which will be taught in this lecture)

To study the basics of oscillator and it's type.

IMPORTANT & RELEVANT QUESTIONS:

essential conditions for sustained oscillations

FEED BACK QUESTIONS (AFTER 20 MINUTES):

OUTCOME OF THE DELIVERED LECTURE: To be written after taking the lecture (Pl. write in bullet points about students' feedback on this lecture, level of understanding of this lecture by students etc.)

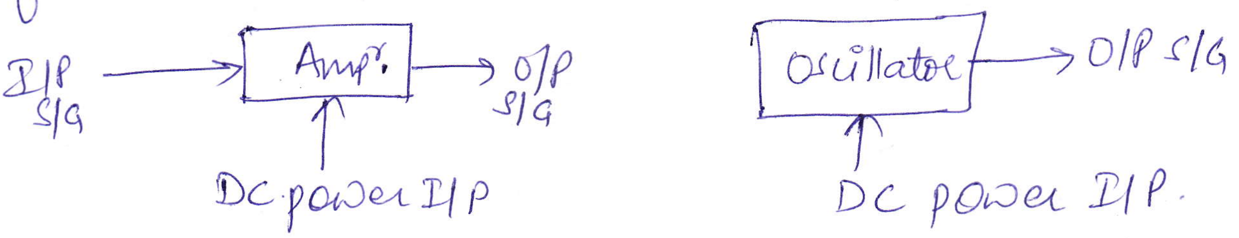
REFERENCES: Text/Ref. Book with Page No. and relevant Internet Websites:

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

Oscillators.

It is a device which generates an alternating voltage.
A circuit which generates an ac O/P signal without requiring any externally applied I/P signal. The oscillator converts dc energy into a.c energy at a very high frq.
So, a function of an oscillator is opposite to that of a rectifier which converts a.c power into dc power.

Function of an oscillator circuit is similar to that of an ampr ckt.



The ampr takes energy from d.c power source & Converts it into ac energy at S/G frequency.
In an ampr circuit, the frq, waveform and

magnitude of ac power generated is controlled by the circuit itself ie, no external controlling voltage is required.

In oscillator, the frq. of the o/p is determined by the passive components used in the oscillator and can be varied at ~~will~~ per needs

An oscillator may be considered as an amplifier which provides its own input signal.

It has variety of applications. Audio frq. and radio frq. s/g generators are extensively used for testing and repairing of radio, television & other electronic equipments.

In radio and television broadcasting, the oscillators are used to generate high frq. carrier waves.

For example — In radio and TV broadcasting the transmitter radiates the signal using a carrier of very high frq (from 550 kHz to 22 MHz) in radio broadcasting and from 47 MHz to 230 MHz in TV broadcasting.

In radio and TV receivers too, there is an oscillator ckt which generates very high frequencies in the tuning stages.

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

Campus: .... Course: .... Class/Section: .... Date: ....
Name of Faculty: .... Name of Subject: .... Code: ....

Types of oscillators :-

Acc. to the nature of generated waveform—

(1) Sinusoidal or harmonic oscillators →
The oscillators which produce sinusoidal or nearly a sinusoidal waveform of a definite frq. are known as sinusoidal oscillators.

(2) Relaxation oscillators or non sinusoidal oscillators :—
Which produce square waves, triangular waves, pulses or sawtooth waves are known as relaxation oscillators.

(b) According to the frequency of generated signals—

(1) Audio frq. oscillators — Which generates signals in the audio frq. range are called audio frq. oscillators.

(2) Radio frq. oscillators :- which generates signals in the radio frq. range are called radio frq. oscillators.

Oscillator	Frq. range
AF oscillators	a few Hz – 20 kHz
RF	20 kHz – 30 MHz
VHF	30 MHz – 300 MHz
UHF	300 MHz – 3 GHz
Microwave oscillators	3 GHz – several GHz.

Sinusoidal Oscillators classified in to –

1) **Tuned ckt or LC feedback oscillators** :-

It uses tuned ckts and called as LC feedback oscillators. Practically available values of L & C confine the application of these oscillators. for the generation of radio frq. signals.

eg → Tuned Collector, Hartley, Colpitts

2) **RC phase shift oscillators** :-

oscillators using R.C network are called RC phase shift oscillators. The example are phase shift oscillator and Wein bridge oscillator. It is usually in audio frq. range.

3) **Negative resistance Oscillators** :-

It uses an active device that possesses a current voltage characteristic curve of –ve slope (within) some range of operation. eg Tunnel diode oscillator

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
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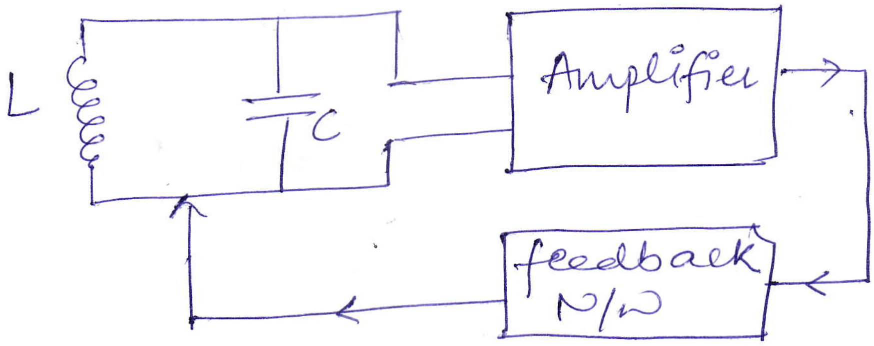
Name of Faculty: .... Name of Subject: .... Code: ....

4) Crystal oscillator :- when piezoelectric crystals are used in place of LC circuit for higher freq. stability.

Essential components of a feedback LC oscillator:-



(i) Tank circuit → It consists of an inductance L connected in parallel with capacitor C. It is known as frequency determining N/W. The freq. of oscillations depends upon the value of Inductance and capacitance.

(2) Transistor Amplifier :-

It is used to amplify the oscillations produced by LC circuit. The ampr. receives dc. power from battery & converts it into a.c power for supplying to the tank circuit. The oscillations produced in tank ckt are applied to the I/P of the transistor. The transistor increases the O/P of these oscillations.

(3) Feedback circuit → It is used to transfer a part of the o/p energy to LC ckt in proper phase. When +ve feedback, overall gain of ampr is

$$A_f = \frac{A}{1 - A\beta}$$

$A\beta$ is feedback factor or loop gain.

If $A\beta = 1$, $A_f = \infty$, Thus, the gain becomes infinity ie, there is O/P without any i/P. The ampr works as oscillator. The condition $A\beta = 1$ is known as Barkhausen criterion of oscillation.

Essential condition for sustained oscillation is

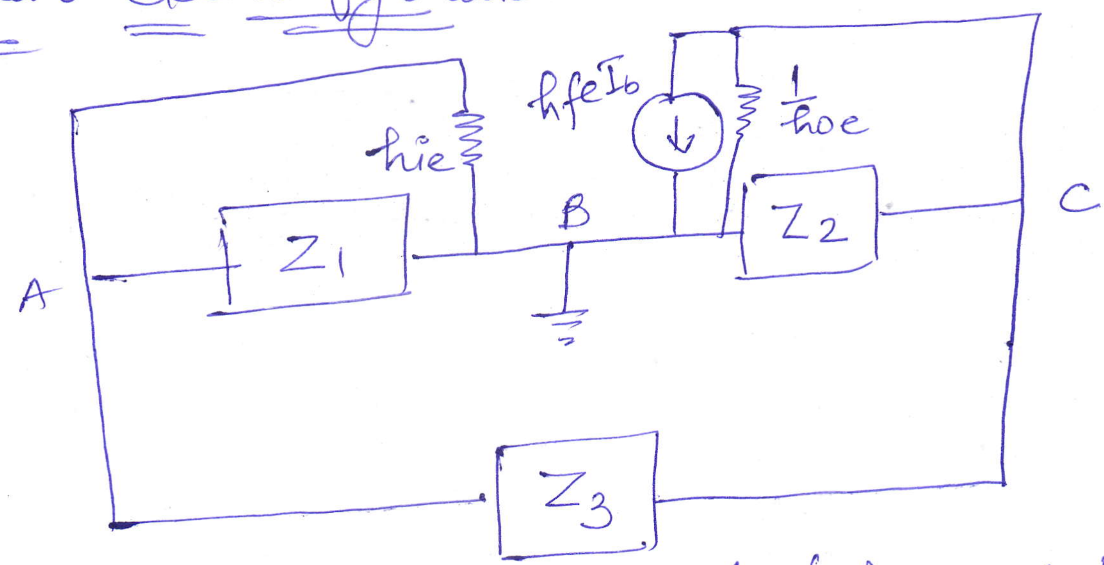
(i) $A\beta = 1$

(ii) The net phase shift around the loop is zero or an integral multiple of 2π (360°).

General form of LC oscillators:-

LC oscillator is a combination of amplifier and feedback components.

Equivalent Ckt configuration:-



⇒ I/P is given btw the terminals 'A' and 'B' and O/P is taken from 'B' and 'C'

⇒ Load impedance Z_L consists of Z_2 in parallel with the series combination of Z_3 and $Z_1 \parallel h_{ie}$.

Let us consider the load impedance Z_L across terminals 'B' and 'E'.

$$Z_L = [\{(h_{ie} \| Z_1) + Z_3\} \| Z_2]$$

$$= \frac{Z_2 \left\{ Z_3 + \frac{Z_1 h_{ie}}{Z_1 + h_{ie}} \right\}}{Z_2 + Z_3 + \frac{Z_1 h_{ie}}{Z_1 + h_{ie}}}$$

$$= \frac{Z_2 [Z_3 (Z_1 + h_{ie}) + Z_1 h_{ie}]}{(Z_2 + Z_3)(Z_1 + h_{ie}) + Z_1 h_{ie}}$$

$$\therefore Z_L = \frac{Z_2 [h_{ie}(Z_1 + Z_3) + Z_1 Z_3]}{h_{ie}(Z_1 + Z_2 + Z_3) + Z_2 Z_1 + Z_3 Z_1}$$

The voltage gain without feedback for CE amplifier is.

$$A_V = -\frac{h_{fe}}{h_{ie}} Z_L$$

$$A_V = -\frac{h_{fe}}{h_{ie}} \times Z_L$$

The feedback factor β can be calculated as follows.

The voltage feedback to I/P terminals

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
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The voltage feedback to the I/P terminals

$$V_f = \frac{V_0(Z_1 \| h_{ie})}{(Z_1 \| h_{ie} + Z_3)}$$ (Applying voltage divider rule to the series combination of $Z_1 \| h_{ie}$ and Z_3) the feedback factor $\beta = \frac{V_f}{V_0}$ then

$$\beta = \frac{V_f}{V_0} = \frac{\frac{Z_1 h_{ie}}{Z_1 + h_{ie}}}{\frac{Z_1 h_{ie}}{Z_1 + h_{ie}} + Z_3}$$

Applying the Barkhausen criterion of sustained oscillation ie $A\beta \geq 1$.

Substitute the values of 'A_v' and 'β', we get

$$-\frac{h_{fe}}{h_{ie}}\left(\frac{Z_2[h_{ie}(Z_1+Z_3)+Z_1Z_3]}{h_{ie}(Z_1+Z_2+Z_3)+Z_2Z_1+Z_3Z_1}\right)\frac{Z_1 h_{ie}}{[Z_3Z_1+h_{ie}(Z_1+Z_3)]} \geq 1$$

or

$$\left(\frac{-h_{fe} Z_1 Z_2}{Z_3Z_1 + Z_2Z_1 + h_{ie}(Z_1+Z_2+Z_3)}\right) \geq 1$$

or $h_{ie}(Z_1+Z_2+Z_3) + Z_2 Z_1 + Z_3 Z_1 = -h_{fe} Z_1 Z_2$

$\therefore$

$$h_{ie}(Z_1+Z_2+Z_3) + Z_1 Z_2(1+h_{fe}) + Z_1 Z_3 = 0$$

This equation is general equation for LC oscillator. Using this equation frequency of oscillation is determined and real part is equated to zero to determine the condition for sustained oscillations.

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

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LECTURE NOTES

Unit-II (Lect III)

Campus: PCE Course: B.Tech Class/Section: II yr - B Date: ....
Name of Faculty: Amit Bathla Name of Subject: AE Code: UEC01
Date (Prep.): .... Date (Del.): ....Unit No.:..................Lect. No: 2..........

OBJECTIVE: To be written before taking the lecture (Pl. write in bullet points the main topics/concepts etc., which will be taught in this lecture)

To study General expression of oscillator ckt

IMPORTANT & RELEVANT QUESTIONS:

FEED BACK QUESTIONS (AFTER 20 MINUTES):

OUTCOME OF THE DELIVERED LECTURE: To be written after taking the lecture (Pl. write in bullet points about students' feedback on this lecture, level of understanding of this lecture by students etc.)

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Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
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Name of Faculty: .... Name of Subject: .... Code: ....

Tuned Collector oscillator

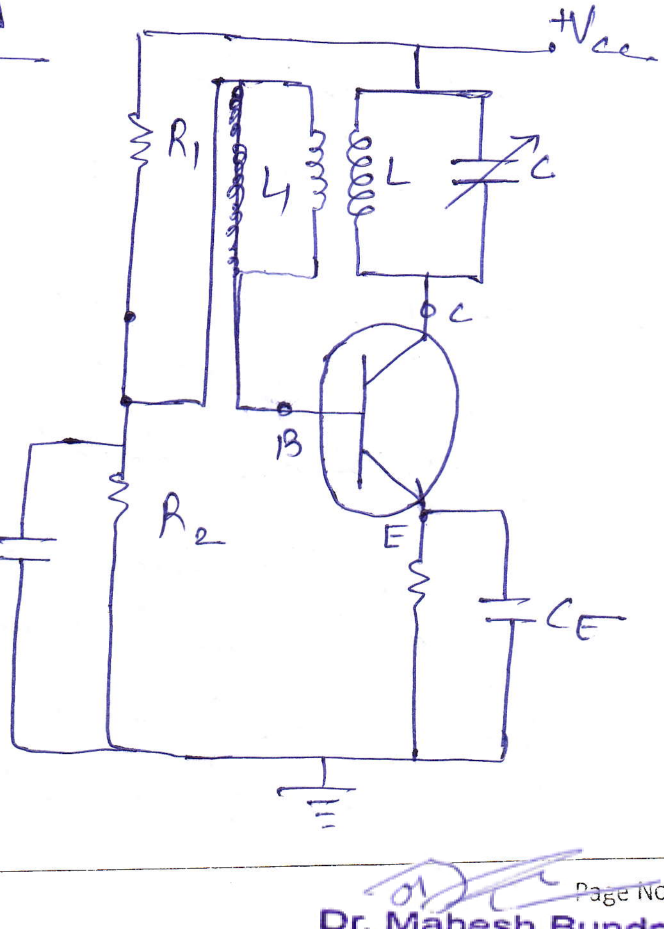
The basic ckt of tuned collector oscillator is shown. It is called tuned collector oscillator because the tuned ckt is connected to the Collector

* The tuned ckt constituted by the capacitor C and transfor mer primary coil L forms the ~~load~~ load Impedence and determine the frequency of oscillations.

* Capacitor C_1 provides ac ground for the transformer Secondary

* The o/p Voltage developed across the tuned ckt is inductively coupled to the base ckt through Sec Coil L_1

* The feedback voltage will appear across base-emitter junction.



Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
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* A phase shift of 180° is provided by the transistor amplifier as it is in CE configuration another phase shift is provided by the transformer. they a total phase shift of 360° appear b/w the i/p and o/p voltages.

Working: when Vcc is switched ON a transient current is caused in the tuned LC ckt it is due to increase of collector current to it's quiescent point the transient current initiates natural oscillations in the tank ckt, these natural oscillations induce some voltage into L_1 by mutual induction which causes corresponding variation in I_B these variations in I_B are amplified β times and appear in the collector ckt. a part of this energy is used to meet the losses in the tank ckt and rest is radiated out in the form of electromagnetic wave.

* The turn ratio L and L_1 are determined by the total losses. heigher is the turn ratio lesser is the f.B voltage applied

- The freq at which B.H criterion is satisfied differs from the resonant frequency of the tuned ckt. this is due to loading of the transformer secondary to some extent.

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
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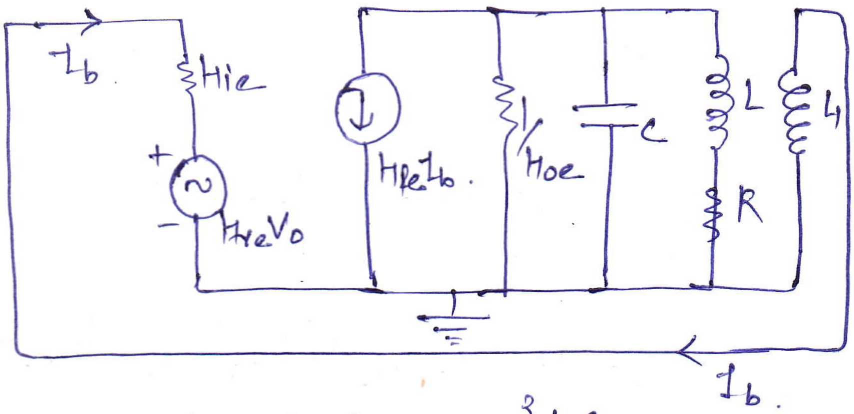
Freq. of oscillations

The eq ckt for analysis of the oscillator



$$\frac{1}{Z_L} = \frac{1}{1/j\omega C} + \frac{1}{R + j\omega L}$$

$$j\omega C + \frac{1}{R + j\omega L} \Rightarrow \frac{1 + j\omega RC - \omega^2 LC}{R + j\omega L}$$

$$Z_L = \frac{R + j\omega L}{1 + j\omega RC - \omega^2 LC} \quad \text{——— (1)}$$

feedback fraction $\beta = \frac{V_s}{V_p} = \frac{-j\omega M I_L}{(R + j\omega L) I_L} = \frac{-j\omega M}{R + j\omega L}$

Voltage Gain A of CE Amplifier $= \frac{-h_{fe} Z_L}{h_{ie} + (h_{ie}h_{oe} - h_{re}h_{fe}) Z_L}$

* -ve sign indicate a phase shift of 180 is introduced by each of transformer and amplifier.

for Barkhausen Criterion for Sustained oscillation

$$|A\beta| = 1 \qquad \frac{1}{|A|} = \beta$$

$$\frac{h_{ie} + (h_{ie}h_{oe} - h_{re}h_{fe})Z_L}{h_{fe}\, Z_L} = \frac{j\omega M}{R + j\omega L}$$

$$\frac{h_{ie}}{Z_L} + (h_{ie}h_{oe} - h_{re}h_{fe}) = \frac{j\omega M\, h_{fe}}{R + j\omega L}$$

from eq (1) Substitute Z_L

$$h_{ie}[1 - \omega^2 LC + j\omega RC] + [h_{ie}h_{oe} - h_{re}h_{fe}](R + j\omega L) = j\omega M h_{fe}$$

$$h_{ie} - \omega^2 LC\, h_{ie} + [h_{ie}h_{oe} - h_{re}h_{fe}]R = j\omega M h_{fe} - j\omega CR h_{ie} - j\omega L[h_{ie}h_{oe} - h_{re}h_{fe}]$$

equating real part to zero.

$$h_{ie} - \omega^2 LC\, h_{ie} + [h_{ie}h_{oe} - h_{re}h_{fe}]R = 0$$

$$\omega^2 = \frac{h_{ie} + R\Delta h}{LC\, h_{ie}}$$

or

$$\omega = \frac{1}{\sqrt{LC}}\sqrt{1 + \frac{R\Delta h}{h_{ie}}}$$

Since Δh and R of coil is very small and h_{ie} is large therefore.

$$\boxed{f = \frac{1}{2\pi\sqrt{LC}}}$$

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
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Campus: .... Course: .... Class/Section: .... Date: ....
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Condition for Sustained oscillation can be obtained by equating imaginary term to 0.

$$M = \frac{RCh_{ie} + L\Delta h}{h_{fe}}$$

The above equation is the minimum Value of mutual inductance M which is required for Sustained oscillations.

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LECTURE NOTES

Campus: PCE Course: B.tech Class/Section: II yr - B Date: ....
Name of Faculty: Anut Bathla Name of Subject: AC Code: 4EC01
Date (Prep.): .... Date (Del.): .... Unit No.: .... Lect. No: 8

OBJECTIVE: To be written before taking the lecture (Pl. write in bullet points the main topics/concepts etc., which will be taught in this lecture)

To

IMPORTANT & RELEVANT QUESTIONS:

FEED BACK QUESTIONS (AFTER 20 MINUTES):

OUTCOME OF THE DELIVERED LECTURE: To be written after taking the lecture (Pl. write in bullet points about students' feedback on this lecture, level of understanding of this lecture by students etc.)

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B.E., M.E., Ph.D.
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Poornima College of Engineering
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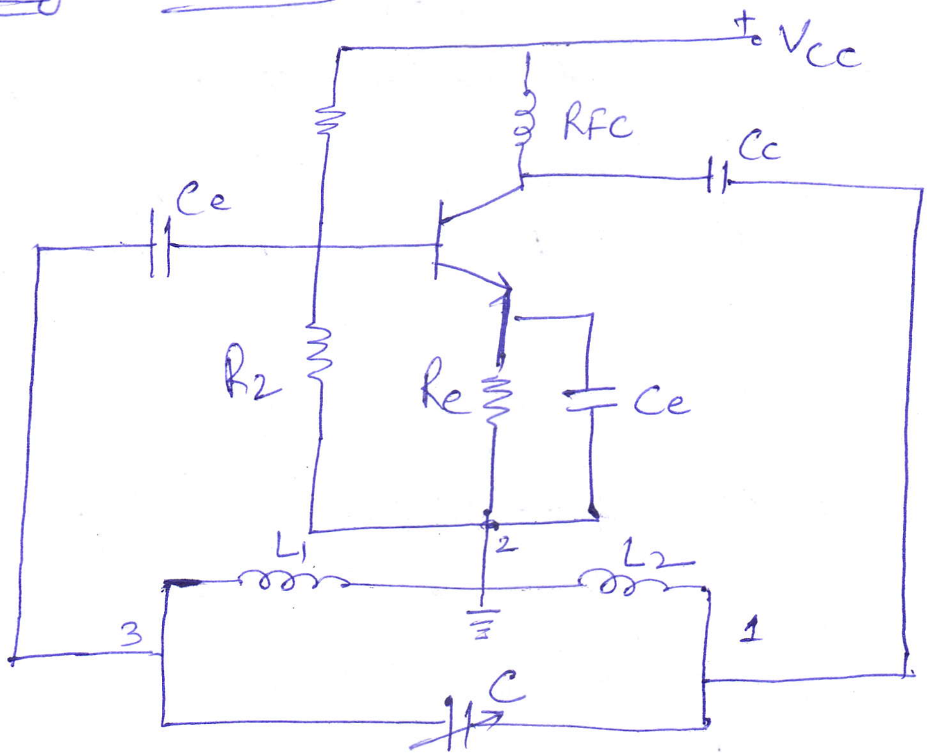
Hartley Oscillator:-



Hartley Oscillator

Resistances R_1, R_2 & Re provides the necessary dc bias to the transistor. Ce is a bypass capacitor used for stabilization of operating point (Q) two Capacitor C_c are coupling capacitor.

The tank Ckt consisting of inductors L_1 and L_2 and a variable capacitor C. The tank Ckt determines the frq. of oscillation. RFC (radio frequency choke) serves two functions first it prevents radio frq. current from reaching the dc power supply second, it prevents the dc supply from short circuiting the ac output voltage.

<u>Ckt operation</u> :-

When the supply voltage is switched ON, a transient current is set up in the tank circuit. As a result, the starting voltage required for oscillations is provided. This current produces an a.c voltage across L_1 and another ac voltage across L_2.
Since the junction (2) of the two coils is grounded, it will be at zero potential. If Terminal 1 is at a +ve potential wrt terminal 2 at some instant of time, then terminal 3 will be at a −ve potential wrt terminal 2 at the same instant.
Thus the voltage across L_1 and L_2 are always in opposite phase.
The voltage across L_2 is output. In this way the parallel resonant circuit (L_1, L_2 and C) provides a phase difference of 180° between the I/P and O/P.

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
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Since the transistor also introduces a phase shift of 180° ∴ the total phase shift is 0° or 360°. Thus at the frequency determined by the tank ckt, the necessary condition for sustained oscillation is satisfied. If the feedback is so adjusted that loop gain is equal to 1, oscillation are sustained.

The resonant freq. of oscillation is gn. by.

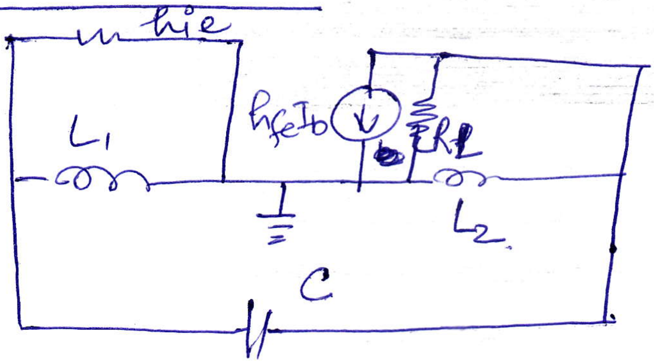
$$f_0 = \frac{1}{2\pi\sqrt{L_{eq}C}}$$

where, $L_{eq} = L_1 + L_2 + 2M$

If Mutual Inductance M is neglected, then $L = L_1 + L_2$

$$\therefore \quad f_0 = \frac{1}{2\pi\sqrt{(L_1+L_2)C}}$$

Frequency of oscillation of hartley oscillator & Equivalent circuit



General Equation for LC oscillators :-

$$h_{ie}(Z_1+Z_2+Z_3)+Z_1Z_2(1+h_{fe})+Z_1Z_3=0 \quad \text{—— (1)}$$

In case of hartley oscillator, substitute

$Z_1 = j\omega L_1$

$Z_2 = j\omega L_2$

$Z_3 = \frac{1}{j\omega C} = \frac{-j}{\omega C}$

$$h_{ie}\, j\omega\left(L_1+L_2-\frac{1}{\omega^2 C}\right)-\omega^2 L_1L_2(1+h_{fe})+\frac{L_1}{C}=0 \quad \text{—— (2)}$$

To determine frq. of oscillation, the imaginary part is equated to zero and we get.

$$\omega h_{ie}\left(L_1+L_2-\frac{1}{\omega^2 C}\right)=0$$

or $L_1+L_2=\frac{1}{\omega^2 C}$ or $\omega^2=\frac{1}{(L_1+L_2)C}$ (3) or $\omega=\frac{1}{(L_1+L_2)C}$

$$\therefore f=\frac{\omega}{2\pi}=\frac{1}{2\pi\sqrt{(L_1+L_2)C}}$$

$$\therefore f=\frac{1}{2\pi\sqrt{L_{eq}C}}$$

$L_{eq}=L_1+L_2$ and if mutual inductance of coil is considered $L_{eq}=L_1+L_2+2M$

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

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DETAILED LECTURE NOTES

Campus: .... Course: .... Class/Section: .... Date: ....
Name of Faculty: .... Name of Subject: .... Code: ....

To determine the condition for sustained oscillation, the real part of equation (2) equated to 0.

$$-\omega^2 L_1 L_2 (1+h_{fe}) + \frac{L_1}{C} = 0$$

or $$\omega^2 L_1 L_2 (1+h_{fe}) - \frac{L_1}{C} = 0$$

$$\frac{L_1}{C} = \omega^2 L_1 L_2 (1+h_{fe})$$

substitute value of ω^2.

$$\frac{L_1}{C} = \frac{L_1 L_2 (1+h_{fe})}{(L_1+L_2)C}$$

or $$L_1 = \frac{L_1 L_2 (1+h_{fe})}{(L_1+L_2)}$$

$$\frac{L_1+L_2}{L_2} = (1+h_{fe})$$

or $$1+\frac{L_1}{L_2} = (1+h_{fe})$$

$$\therefore h_{fe} = \frac{L_1}{L_2} = \beta$$

$$h_{fe} = \left(\frac{L_1+M}{L_2+M}\right)$$ If mutual inductance of coil is considered.

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
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4E4120

B. Tech. IV Sem. (Main/Back) Exam., June/July-2014
Electronics Instrumentation & Control Engg.
4EI1A Analog Electronics
Common with EE, EX, EC & EI

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:-

*Attempt any **five questions**, selecting **one question** from **each unit**. 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.

1. ____________________ 2. ____________________

UNIT-I

Q.1. (a) Discuss with the help of a circuit example, the purpose of providing (i) negative feedback (ii) positive feedback in amplifiers. [8]

(b) A negative feedback of $\beta = 0.002$ is applied to our amplifier of gain 1000. Calmlate the change in overall gain of the feedback amplifier if the internal amplifier is subjected to a gain reduction of 15%. [8]

OR

Q.1. (a) Show that the negative feedback in amplifiers increases the bandwidth and improves signal to noise ratio. [8]

(b) Draw and explain the current shunt feedback. [8]

UNIT-II

Q.2. (a) State the Barkhausen conditions for an electronic system to oscillate with feedback. [8]

(b) Draw the circuit diagram of a colpitts oscillator and explain its working. [8]

OR

Q.2. (a) Draw the circuit diagram of an R-C phase shift oscillator and obtain an expression for its frequency of oscillation. [8]

(b) Differentiate between the monostable and bistable multivibrator. [8]

UNIT-III

Q.3. (a) Explain how would you arrive at the hybrid - π equivalent circuit model in CE configuration at high frequencies. Explain the different parameters involved in the circuit. [8]

(b) A CE – connected amplifier has C_{cb} = 5pF, C_{be} = 12pF, h_{fe} = 100, h_{ie} = 1.5 kΩ. Determine input capacitance to the circuit for a circuit collector resistance of 12Ω. [8]

OR

Q.3. (a) Draw the circuit of emitter follower at high frequencies and explain its working.[8]

(b) A transistor with alpha cut-off frequency = 5 MHz and h_{fe} or β = 50 is used in a CE configuration. When connected to an amplifier, it has stray capacitance of 80 pF at the output terminals. Determine the upper 3dB frequency when

(i) R_L = 10kΩ and (ii) R_L = 100kΩ [8]

UNIT-IV

Q.4. (a) What is parallel resonances? What are its features? How is it different from series resonances? [8]

(b) Explain the reasons for potential instability in tuned amplifiers. [8]

OR

Q.4. (a) Draw the circuit diagram of a collector tuned amplifier and derive expressions for the voltage gain at the tuned frequency and bandwidth. [8]

(b) Explain in brief the advantage of using double – tuned circuit over a single tuned circuit. Draw the circuit diagram of double tuned amplifier and its frequency response. [8]

UNIT-V

Q.5. (a) What is a power amplifier? In what respects does it differ from a voltage amplifier? Why heat sink are needed. [8]

(b) Explain collector efficiency, distortion and power dissipation. [8]

OR

Q.5. (a) Prove that for class B push-pull power amplifier the theoretical conversion efficiency is 78.5% and power dissipation capability of each transistor used shall be at least 0-2 times the maximum power output of the amplifier. [8]

(b) Draw the circuit of class D and class E amplifier and their application. [8]

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4E4120

Roll No. ___________

Total No of Pages: 3

4E4120

B. Tech. IV Sem. (Main/Back) Exam., June/July-2014

Electronics Instrumentation & Control Engg.

4EI1A Analog Electronics

Common with EE, EX, EC & EI

Time: 3 Hours

Maximum Marks: 80

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Instructions to Candidates:-

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Use of following supporting material is permitted during examination.

1.___________________ 2.___________________

UNIT-I

Q.1. (a) Discuss with the help of a circuit example, the purpose of providing (i) negative feedback (ii) positive feedback in amplifiers. [8]

(b) A negative feedback of $\beta = 0.002$ is applied to our amplifier of gain 1000. Calmlate the change in overall gain of the feedback amplifier if the internal amplifier is subjected to a gain reduction of 15%. [8]

OR

Q.1. (a) Show that the negative feedback in amplifiers increases the bandwidth and improves signal to noise ratio. [8]

(b) Draw and explain the current shunt feedback. [8]

UNIT-II

Q.2. (a) State the Barkhausen conditions for an electronic system to oscillate with feedback. [8]

(b) Draw the circuit diagram of a colpitts oscillator and explain its working. [8]

OR

Q.2. (a) Draw the circuit diagram of an R-C phase shift oscillator and obtain an expression for its frequency of oscillation. [8]

(b) Differentiate between the monostable and bistable multivibrator. [8]

UNIT-III

Q.3. (a) Explain how would you arrive at the hybrid - π equivalent circuit model in CE configuration at high frequencies. Explain the different parameters involved in the circuit. [8]

(b) A CE – connected amplifier has C_{cb} = 5pF, C_{be} = 12pF, h_{fe} = 100, h_{ie} = 1.5 kΩ. Determine input capacitance to the circuit for a circuit collector resistance of 12Ω. [8]

OR

Q.3. (a) Draw the circuit of emitter follower at high frequencies and explain its working. [8]

(b) A transistor with alpha cut-off frequency = 5 MHz and h_{fe} or β = 50 is used in a CE configuration. When connected to an amplifier, it has stray capacitance of 80 pF at the output terminals. Determine the upper 3dB frequency when

(i) R_L = 10kΩ and (ii) R_L = 100kΩ [8]

UNIT-IV

Q.4. (a) What is parallel resonances? What are its features? How is it different from series resonances? [8]

(b) Explain the reasons for potential instability in tuned amplifiers. [8]

OR

Q.4. (a) Draw the circuit diagram of a collector tuned amplifier and derive expressions for the voltage gain at the tuned frequency and bandwidth. [8]

(b) Explain in brief the advantage of using double – tuned circuit over a single tuned circuit. Draw the circuit diagram of double tuned amplifier and its frequency response. [8]

UNIT-V

Q.5. (a) What is a power amplifier? In what respects does it differ from a voltage amplifier? Why heat sink are needed. [8]

(b) Explain collector efficiency, distortion and power dissipation. [8]

OR

Q.5. (a) Prove that for class B push-pull power amplifier the theoretical conversion efficiency is 78.5% and power dissipation capability of each transistor used shall be at least 0-2 times the maximum power output of the amplifier. [8]

(b) Draw the circuit of class D and class E amplifier and their application. [8]

------x------x------

4E 4120

Roll No. ____________ [Total No. of Pages : 3

4E 4120

B.Tech. IV Semester (Main/Back) Examination, June/July - 2015

Electrical Engineering

4EE1A Analog Electronics

(Common to EE,EX, EC and EI)

Time : 3 Hours **Maximum Marks : 80**

Min. Passing Marks : 26

Instructions to Candidates:

*Attempt any **five** questions, selecting **one question** from **each unit**. 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.*

Unit - I

1. For BJT feedback amplifier shown in fig-(1) $h_{fe}=100$, $h_{ie}=1k$, neglect h_{re} & h_{oe}. Find with $R_e=0\Omega$

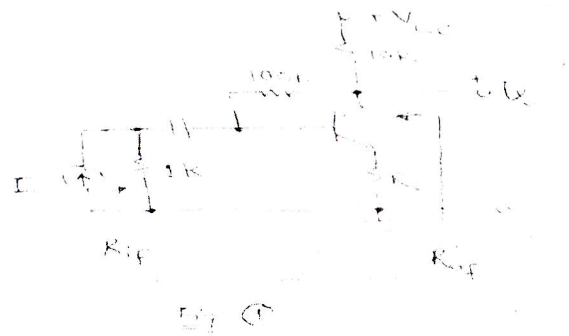
   a) $R_{Mf} = \frac{v_0}{I_s}$

   b) $A_{vf} = \frac{v_0}{v_s}$

   c) R_{if}

   d) R^1_{of}

   e) Repeat the four preceding calculation if $R_e=1k\Omega$ **(16)**



OR

1.

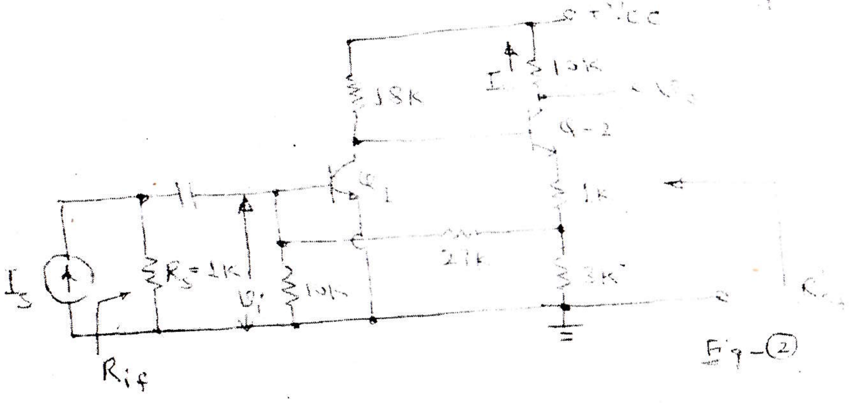


Fig-(2)

For the circuit shown in fig-(2) with h_{fe}=50, h_{ie}=2k h_{re}= h_{oe}= 0. Find

a) $A_{IF} = \frac{I_0}{I_S}$

b) R_{if}

c) $A_{vf} = \frac{v_0}{v_s}$ Where $I_s = \frac{v_s}{R_s}$

d) $A'_{vf} = \frac{v_0}{v_i}$ **(16)**

e) R'_{of}

2. a) Distinguish between Hartley and Colpitts oscillators and derive the expressions for oscillating frequencies. **(8)**

b) Find the minimum voltage gain and the frequency of oscillation for a colpitts oscillators with $c_1 = 0.004\ \mu f$, $c_2 = 0.03 \mu f$ and $L = 4.0 mH$. **(8)**

OR

Explain following with required circuits and waveforms.

a) Schmitt trigger **(8)**

b) Blocking Oscillator. **(8)**

Unit - III

3. Draw hybrid - π model and explain each parameter. Also find the inter-relation between h-parameters and hybrid- π parameters. **(16)**

OR

3. a) With g_m=50mA/v, $r_{b'e}$ =1k, C_e=1pf & C_c=0.2pf, determine the values of f_β & f_T **(8)**

b) Prove $f_H = \frac{g_m + g_{b'e}}{2\pi(C_L + C_c)}$ where C_L= Load capacitance **(8)**

Unit - IV

4. a) At resonance in the circuit fig-(3), I=10 mA and V=7.5v. The inductive reactance is 455 Ω & C=350 pf. Find R,Circuit Q and resonant frequency. **(8)**

b) Parallel resonant circuit as in fig-(3) has Q=120 & I=0.6mA. The V is 12v. Find reactances of L & C at resonance f_o=3.5MHz **(8)**

OR

4. a) Explain stagger tuned amplifier with required figures. **(8)**

b) Explain class-C tuned amplifier with required figures. **(8)**

Unit - V

5. Compare class A, class B, class AB and class C power amplifiers with required circuit diagrams and waveforms **(16)**

OR

5. a) A class B push-pull amplifier uses Vcc=15v and R_L=8 Ω. Find the maximum input power, ac output power, conversion efficiency and power dissipated by each transistor **(8)**

b) Different complementary symmetry and quasi complimentary symmetryamplifiers. **(8)**

OR

Q.3 (a) Write a short note on Emitter follower at high frequency and drive expression for high frequency voltage gain. [8]

(b) Given the following transistor measurement at $I_C = 5mA$, $V_{CE} = 10V$, and at room temperature. $h_{fe} = 100$, $h_{ie} = 600ohm$, $A_i = 10$ at $10MH_Z$, $C_C = 3pF$. Find F_B, F_T, C_e, $r_{b'e}$ and $r_{bb'}$. [8]

UNIT-IV

Q.4 (a) Draw the parallel resonant circuit. Obtain the expression for its band width and Q factor. [6]

(b) The single tuned amplifier circuit consists of tuned circuit having R = 50ohms, L = 10mH and C = 0.1μF. Determine the [10]

(i) Resonant frequency
(ii) Q factor of the tank circuit and
(iii) BW of the amplifier.

OR

Q.4 (a) What is stagger tuned amplifier? Explain its working with help of frequency response. [8]

(b) Draw and explain the circuit of double tuned amplifier with the help of frequency response. [8]

UNIT-V

Q.5 (a) Derive an expression for output power of class A large signal amplifier in terms of V_{max}, V_{min}, I_{max} and I_{min}. [8]

(b) What is meant by crossover distortion in class B amplifier? Explain how it is overcome in class AB operation. [8]

OR

Q.5 (a) Explain complimentary and quasi complimentary symmetry push pull power amplifier with the help of circuit diagrams. [8]

(b) A class B push – pull amplifier is supplied with $V_{CC} = 50V$. The signal swings the collector voltage down to $V_{min} = 5V$. The total dissipation in both transistors is 40W. Find the total power conversion efficiency. [8]

4E4120

4E4120

B.Tech. IV-Sem (Main & Back)Exam; June-July 2016
Electrical & Electronics Engineering
4EX1A Analog Electronics
Common with EE, EX, EC, EI

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks (Main & Back): 26
Min. Passing Marks (Old Back): 24

Instructions to Candidates:-

*Attempt any **five questions**, selecting **one question** from **each unit**. 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.

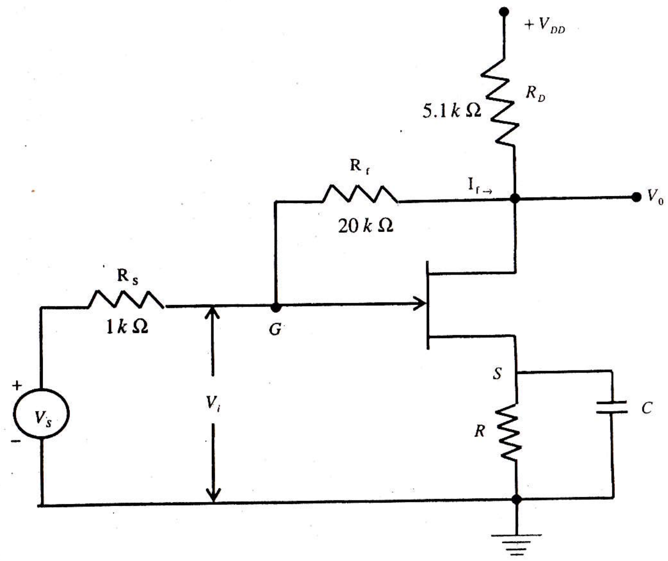
(Mentioned in form No.205)

1. NIL 2. NIL

UNIT-I

Q.1 (a) What are the four possible topologies of a feedback amplifier? Explain with neat sketches. [8]

(b) Calculate the voltage gain with and without feedback for the circuit given in figure, with values, $g_m = 5mA/V$, $R_D = 5.1K\Omega$, $R_s = 1K\Omega$, $R_f = 20K\Omega$, $r_d = 1M\Omega$. [8]



OR

Q.1 (a) Sketch the circuit of a current series feed – back amplifier. Obtain the expression for the voltage gain and the input resistance of this amplifier. [8]

(b) Calculate the voltage gain, input & output resistance of a voltage series feedback amplifiers having $A_v = 300$, $R_i = 1.5K\Omega$, $R_o = 50K\Omega$ and $\beta = 1/15$. [8]

UNIT-II

Q.2 (a) Sketch the circuit for a wein bridge oscillator. What determines the frequency of Oscillators? Will oscillations take place if the bridge is balanced? [8]

(b) In a transistor colpitts oscillator has the following parameters. [8]

$L = 100\mu H$, $L_{RFC} = 0.6mH$, $C_2 = 0.001\mu F$, $C_1 = 0.01\mu F$, $C_c = 10\mu F$

Determine –

(i) Operating frequency

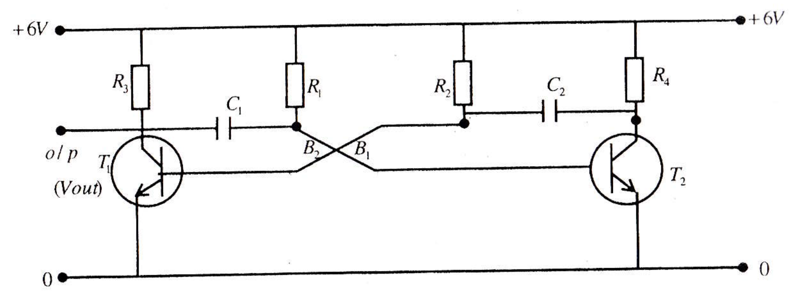
(ii) Feedback – fraction

(iii) Minimum gain to sustain oscillations and emitter resistance if $R_C = 2.5K\Omega$.

OR

Q.2 (a) What is Schmitt triggering? Explain the working of Schmitt trigger with the help of a neat circuit diagram and waveforms. [8]

(b) In a astable multi vibrator circuit diagram shown below, $R_1 = R_2 = 5K\Omega$, $R_3 = R_4 = 0.4K\Omega$ and $C_1 = C_2 = 0.02\mu F$. [8]



Determine –

(i) Time period and frequency of circuit oscillation.

(ii) Minimum value of transistor β.

UNIT-III

Q.3 (a) Draw neat diagram of hybrid - π model for a transistor at high frequency in CE configuration, discuss in brief. [10]

(b) In a hybrid π model, prove that diffusion capacitance at an emitter junction - $C_{de} = g_m W^2/(2D_B)$ where, g_m = transistor transconductance; W = base width; D_B = diffusion constant for minority in base region. [6]

4E2086

Roll No. : ______________________ Total Printed Pages : 3

4E2086

B. Tech. (Sem. IV) (Back/Old Scheme) Examination, June/July - 2011
Electronics & Comm.
4EI2 Analog Electronics
Common for EC & EIC

Time : 3 Hours] [Total Marks : 80
[Min. Passing Marks : 24

Attempt any **five** *questions. Selecting* **one** *question from each unit.*
All questions are carry **equal** *marks.*
Schematic diagrams must be shown wherever necessary. Any data you feel missing any 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

UNIT - I

1 (a) Draw the block diagram of a negative feedback amplifier. Derive an expression for the voltage gain of an amplifier of gain A when subjected to negative feedback with a feedback fraction B. 8

(b) State the merits and demerits of negative feedback amplifier. 8

2 (a) Discuss the effect of negative feedback on :
(i) Distortion
(ii) Output impedance
(iii) Input impedance

(b) An amplifier with current feedback has the following specifications :

$h_{fe} = 100\Omega$; $h_{ie} = 2000\Omega$, $R_1 = 15000\Omega$

$R_2 = 5600\Omega$, $R_e = 100\Omega$ and $R_L = 470\Omega$

Calculate the values of voltage gain and input resistance of the amplifier with and without feedback. 8

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

UNIT - II

3 (a) Find an expression for the frequency of oscillations and condition for sustaining the oscillation in tuned collector oscillator.

8

(b) Describe Hartley oscillator circuit and explain its action.

8

4 (a) Sketch the circuit of schmitt trigger and explain its operation.

8

(b) What is a monostable multivibrator ? Explain its working with the help of neat waveform ?

8

UNIT - III

5 Draw the circuit diagram of emitter follower at high frequencies. Also explain its behaviour at high frequencies with necessary expression and parameter.

16

6 Determine gain bandwidth product, unity gain frequency using hybrid π model for CE configuration.

16

UNIT - IV

7 (a) Sketch 2 - input XOR function using static CMOS circuit technique, assume complementary signals are not available.

8

(b) Explain with neat diagram the working of a totem pole two input TTL NAND gate.

8

8 (a) Explain the parameters used to characterize logic families. 8

(b) Write brief notes on ECL and RTL logic families. 8

UNIT - V

9 (a) Draw the circuit diagram of a push - pull amplifier. Explain its operation. Discuss its advantages and disadvantages. 3+3+2

(b) Show that maximum collector efficiency of class A transformer coupled power amplifier is 50%. 8

10 (a) What do you understand by class A, B and C power amplifiers ? 8

(b) Define and explain the following terms as applied to power amplifiers :

(i) Collector efficiency

(ii) Power dissipiation capability

(iii) Overall gain. 3+3+2

4E2086

Roll No. : ____________________ Total Printed Pages : 3

4E2086

B. Tech. (Sem. IV) (Main / Back) Examination, June/July - 2013
Electronics Instrumentation & Control
4IC2 Analog Electronics (Old Back) (Common for 4IC2, 4EC2)

Time : 3 Hours] [Total Marks : 80
[Min. Passing Marks : 24

Attempt any five questions, selecting one question from each unit. 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

UNIT - I

1 (a) What are the four possible topologies of a feedback amplifier ? Identify the output signal X_0 and Feedback signal X_f for each topologies (either as current or voltage) 8

(b) List the five characteristics of an amplifier which are modified by negative feedback. Explain them in brief. 8

OR

1 (a) Draw and explain the circuit of a current - series feedback amplifier. 8

(b) List the steps required to carry out the analysis of a feedback amplifier. Explain in brief. 8

UNIT - II

2 (a) Sketch and explain the circuit of Schemitt trigger using a bi-polar function transistor. 8

(b) Give the two Barkhausen conditions required in order for sinusoidal oscillations to be sustained. Also draw neat diagrams. 8

OR

2 (a) Sketch the circuit for a Wein briedge Oscillator. What determines the frequency of Oscillation ? Will Oscillations take place if the bridge is balanced ? 8

(b) Sketch the topology for a generalized resonant - circuit Oscillator, using impedance Z_1, Z_2, Z_3. At what frequency will the circuit Oscillate ? 8

UNIT - III

3 (a) Draw the small signal high frequency CE model of a transistor. Explain the same. 8

(b) What is the physical origin of the two capacitors in the hybrid - model ? What is the order of magnitude of each capacitance ? 8

OR

3 (a) Derive the expression for the CE short circuit current gain Ai as a function of frequency. 8

(b) Define f_b, f_T. What is the relationship between f_b and f_T. 8

UNIT - IV

4 Write short note on any two :

(a) Band Pass Amplifier

(b) Double Tuned Transformer Coupled Amplifier

(c) Stagger Tuned Amplifier

(d) Parallel resonant circuits.

8+8

UNIT - V

5 (a) Explain quasi complementary symmetry amplifiers.

8

(b) Draw the diagram of a transformer coupled single - transistor output stage, and explain the need for impedance matching.

8

OR

5 (a) Explain why even harmonics are not present in a push-pull amplifier. Give two additional advantages of this circuit over that of a single transistor amplifier.

8

(b) Show that the maximum conversion efficiency of the idealized class B push pull circuit is 78.5%.

8

Roll No. _______________ [Total No. of Pages : 2

4E 2086

4E 2086

B.Tech. IV Semester (Main/Back) Examination 2012

Electronics Instrumentation & Control

4IC2 Analog Electronics (Old Back)

Common for 4IC2, 4EC2

Time : 3 Hours **Maximum Marks : 80**

Min. Passing Marks : 24

Instructions to Candidates:

*Attempt any **Five questions** selecting **one question** from **each unit**. All questions carry **equal marks**. (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.*

Unit - I

1. a) Give complete classification of feedback amplifiers with the help of neat diagram. (8)

   b) If an amplifier with gain of -1000 and feedback of $\beta = -0.1$ has a gain change of 20% due to temperature, calculate the change in gain of feedback amplifier. (8)

OR

1. a) What is the effect of negative feedback on gain and bandwidth of an amplifier? (8)

   b) Explain and analyse with the help of circuit diagram, a current-series feedback amplifier. (8)

Unit - II

2. a) Draw circuit diagram of R-C phase shift oscillator and explain its working. (8)

   b) What is Barkhausen criterion for sustained oscillation. With the help of waveform, explain how oscillations are buildup if criterion is not met. (8)

OR

2. a) Write a short note on crystal oscillator. (8)

   b) Explain working of Transistor Colpitt oscillator with neat circuit diagram. (8)

Unit - III

3. a) Draw hybrid π model for a transistor in CE configuration. Define various parameters. **(8)**

   b) Following transistor measurements made at $I_C = 5mA$, $V_{CE} = 10V$ and at room temperature. $h_{fe} = 100$, $h_{ie} = 600\Omega$ $|Ai| = 10$ at 10 MHz and $C_C = 3pF$. Find f_B, f_T, C_e, $r_{b'e}$, $r_{bb'}$. **(8)**

OR

3. a) Draw and explain the small signal equivalent circuit for emitter follower stage at high frequencies. **(8)**

   b) Explain alpha cutoff frequency. Derive expression for diffusion capacitance C_{D_e} **(8)**

Unit - IV

4. a) Draw circuit of single tuned amplifier and explain its working with frequency response curve. **(8)**

   b) Draw parallel resonant circuit and obtain the expression for its bandwidth. **(8)**

OR

4. a) Explain stagger tuned amplifier with it frequency response curve. (7)

   b) The single tuned amplifier with capacitive coupling consists of tuned circuit having $R = 10\Omega$, $L = 20mH$, $C = 0.05\mu F$. Determine

      i) Resonant frequency

      ii) Q-factor

      iii) Band width of amplifier. **(9)**

Unit - V

5. a) Distinguish amongst class A, class B and class 'C' amplifiers **(8)**

   b) Draw the circuit and explain the operating of a class A push pull amplifiers. **(8)**

OR

5. a) Determine the overall efficiency of class B power amplifier when $V_{CC} = 20V$ and $V_{CE_{min}} = 2.5V$. **(8)**

   b) What is difference between voltage amplifier and power amplifier. Classify power amplifier according to mode of operation. **(8)**

POORNIMA COLLEGE OF ENGINEERING ,JAIPUR

QUIZ

UNIT-1(FEEDBACK AMPLIFIER)

Year-II Branch-ECE Sec-C

1. Voltage Series feedback (also called series-shunt feedback) results in
a) Increase in both input & output impedances
b) Decreases in both input & output impedances
c) Increase in input impedance & decreases in output impedance
d) Decrease in input impedance & increase in output impedance

2. Negative feedback in an amplifier
a) Reduces gain
b) Increase frequency &phase distortion
c) Reduces bandwidth
d) Increases noise

3.The gain of an amplifier with feedback is known as
a. resonant
b. open loop
c. closed loop
d. none of these

4. feedback circuit
a. is independent of frequency
b. is strongly dependent on frequency
c. is moderately dependent on frequency
d. none of these

5. using negative feedback the distortion will be
a. D(1-AB)
b. D(1+AB)
c D/(1+AB)
d. D/(1-AB)

6.The feedback in emitter follower is
a. 50%
b.100%
c. 0%
d.0.1%

7. a circuit using an op-amp has
a. voltage series feedback
b. voltage shunt feedback

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

c. current series
d. current shunt

8.a feedback circuit usually employs-------- network
a. resistive b. capacitive
c. inductive d. none of these

9. the gain of amplifier without feedback is 100 db. If a negative feedback of 3db is applied,the gain of the amplifier will become
A. 101.5db
b. 300db
c. 103 db
d. 97db

10. the input impedance (Zi) and the output impedance(Zo) of an ideal trans-conductance amplifier are
a. Zi=0 ,Zo=0
b. Zi=0 ,Zo=infinite
c. Zi=infinite ,Zo=0
d. Zi=infinite ,Zo=infinite

11.which statement is wrong regarding negative feedback
a. it improves gain stability
b. it reduces distortion
c. it increases the gain bandwidth product
d. none of these

12. if A=500 and B=0.01. Hence desensitivity will be
a. 6
b. 83.33
c. 5
d. none of these

13.in emitter follower circuit
a. voltage series feedback
b. current series
c. current shunt
d. voltage shunt

14. negative feedback
a. decreases higher and lower cut off frequency
b. increases higher and lower cut off frequency
c. decreases lower and increases higher cut off frequency
d. decreases higher and lower cut off frequency

15. FET source follower circuit is a negative feedback amplifier using
a. voltage series
b. current series
c. current shunt
d. voltage shunt

16. an amplifier with resistive negative feedback has two left half plane poles in open loop transfer function the amplifier
a. will always be unstable at high frequency
b. will be stable for all frequency
c. will oscillator at low frequency
d. may be unstable

17. the transfer gain for amplifier with feedback
a. A/1+AB
b. A/1-AB
c. 1/AB
d. none of these

18. ideal value of Ri in voltage amplifier
a. infinite
b. 0
c. 1
d. none of these

19.positive feedback is used in
a. amplifier
b. oscillator
c. rectifier
d. none of these

20.for current shunt amplifier noise will be
a. reduced
b. increased
c. same
d. none of these

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

PGC	DETAILED LECTURE NOTES	DATE: 29/01/2018
Name of Faculty: Bhawna kumawat	College: PCE	Dept: EC
Name of Subject with Code: Analog Electronics 4EC01A	Branch: EC	Class: IVth Sem

Assignment Sheet

Sheet No:-1. 1 **Name of Student:-**____________________________

Unit No:-1 **Unit Name:- Feedback Amplifiers**

Q1) A current amplifier has an input resistance of 10Ω, and an output resistance of 10 kΩ and a current gain of 1,000. It is fed by a current source having a current resistance of 10kΩ and its output is connected to a 10Ω load resistance. Find the voltage and power gain.

Q2) An amplifier with negative feedback gives an output of 12.5 volts with an input of 1. 5V. When feedback is removed, it requires 0.25V input for the same output. Find the value of β, if the input and output are in phase and β is real.

Q3) An amplifier with negative feedback has a gain of -100. It is found that without feedback an input signal of 50 mV is required to produce a given output whereas with feedback the input signal must be 0.06V for the same output. Calculate the amount of feedback in dB .

Q4) Calculate the voltage gain, input and output resistances of a voltage series feedback amplifier having A_v=300, R_i =1.5kΩ, R_o= 50 kΩ and $\beta = \frac{1}{15}$.

Q5) An amplifier has a midband gain of 200 without feedback. The 3dB frequency width of it is 200kHz. The amplifier is to be used as a video amplifier that requires 5MHz bandwidth. What gain can be obtained and what feedback must be used? What bandwidth could be obtained if the feedback were 100%.

Q6) Find the type of feedback in the following circuit. Also determine the value of feedback factor (β)

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

PGC	DETAILED LECTURE NOTES	DATE: 29/01/2018
Name of Faculty: Bhawna kumawat	College: PCE	Dept: EC
Name of Subject with Code: Analog Electronics 4EC01A	Branch: EC	Class: IVth Sem

Assignment Sheet

Sheet No:-1.2 **Name of Student:-**________________________

Unit No:-1 **Unit Name:- Feedback Amplifiers**

Q1) An amplifier has a voltage gain of 40. The amplifier is now modified to provide a 10% negative feedback in series with the input. Calculate Voltage Gain with feedback.

Q2) A negative feedback of $\beta = 0.002$ is applied to an amplifier of gain 1,000. Calculate the change in overall gain of the feedback amplifier if the internal amplifier is subjected to a gain reduction of 15%.

Q3) An amplifier with a closed loop gain of 100 is required and this gain should not vary more than 1% when the inherent gain of the amplifier without feedback varies by 20%. Find the values of A_v.

Q4) A negative feedback amplifier in voltage series configuration feeds 10% of the output back to the input. Voltage gin of the amplifier without feedback is 100. Input and output resistances are 10kΩ and 1kΩ respectively. Find percentage reduction in voltage gain, input resistance and output resistance with feedback.

Q5) An amplifier has a mid-frequency gain of 100 and a bandwidth of 200 kHz.

(i) What will be the new bandwidth and gain, if 5% negative feedback is introduced?

(ii) What should be the amount of feedback, if the bandwidth is to be restricted to 1MHz

Q6) For the given feedback amplifier circuit, h_{fe}= 100, h_{ie}= 1kΩ and negative h_{re} and h_{oe}. Find (i) R_{if} (ii) R'_{of}

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

PGC DETAILED LECTURE NOTES DATE: 29/01/2018

Name of Faculty: Bhawna kumawat College: PCE Dept: EC

Name of Subject with Code: Analog Electronics 4EC01A Branch: EC Class: IV[th] Sem

Assignment Sheet

Sheet No:-1.3 **Name of Student:-**____________________

Unit No:-1 **Unit Name:- Feedback Amplifiers**

Q1) An amplifier with voltage gain of 60 dB uses $\frac{1}{20}$ of its output in negative feedback. Calculate the gain with feedback in dB.

Q2) An amplifier with an open loop voltage gain of 1,000 delivers 10 w of output power at 10% harmonic distortion when the input signal is 10 mV. If 40 dB negative voltage-series feedback is applied and the output power is to remain at 10 W, determine required input signal.

Q3) If the open-loop gain A_v =10,000 and feedback ratio $\beta = \frac{1}{10}$, then for a negative feedback, find the percentage change in closed loop gain when open-loop gain varies 50% with temperature.

Q4) An amplifier with a gain of 60dB has an output impedance of 10kΩ. It is required to modify its output impedance to 1kΩ. What type of feedback to be applied? Calculate the feedback factor. Also find the percentage change in the overall gain, for a 10% change in the open loop gain of the amplifier.

Q5) An amplifier with an open-loop voltage gain of 1,000 delivers 10 W of output power at 10% second harmonic distortion, when the input signal is 10 mV. If 40 dB negative voltage-series feedback is applied and the output power is to remain at 10 W, determine (i) closed loop gain

Q6) Do the feedback analysis of the following circuit to determine (i) feedback topology, (ii) Feedback factor (β).

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

Name of Faculty: Bhawna kumawat College: PCE Dept: EC

Name of Subject with Code: Analog Electronics 4EC01A Branch: EC Class: IV[th] Sem

Assignment Sheet

Sheet No:-1.4 **Name of Student:-**____________________

Unit No:-1 **Unit Name:- Feedback Amplifiers**

Q1) Voltage gain of an amplifier without feedback is 60 dB. It decreases to 40 dB with feedback. Calculate the feedback factor.

Q2) An amplifier has a voltage gain of 40. The amplifier is now modified to provide a 10% negative feedback in series with the input. Calculate the loop gain.

Q3) An amplifier has an input of 10 mV and a gain of 200 without feedback. The distortion produced at the output of the amplifier is 10%. It is desired to reduce the distortion to 1% by using negative feedback .Calculate the gain and output voltage with feedback.

Q4) An amplifier with a gain of 60dB. It has an output impedance of Z_0= 12kΩ. It is required to modify the output impedance to 600Ω by applying negative feedback. Calculate the value of feedback factor. Also find the percentage change in overall gain $\frac{dA_f}{A_f}$ for 10% change in gain of internal amplifier $\frac{dA}{A}$.

Q5) An amplifier has a voltage gain of 20. The amplifier is now modified to provide a 5% negative feedback in series with the input. Calculate the amount of feedback in dB.

Q6) The following circuit has following parameters:

R_C=4kΩ, h_{ie}=1.1 kΩ, R'= 40kΩ,h_{fe}=50, R_s=10kΩ, h_{re}= h_{oe}=0. Find (i) A_{vf} (ii) R_{inf}

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

Name of Faculty: Bhawna kumawat | College: PCE | Dept: EC

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Assignment Sheet

Sheet No:-1.5 **Name of Student:-__________________________**

Unit No:-1 **Unit Name:- Feedback Amplifiers**

Q1) A single stage transistor amplifier has a voltage gain of 600 without feedback, and 50 with feedback. Calculate the percentage of output which is feedback to the input.

Q2) An amplifier with a closed loop gain of 100 is required and this gain should not vary more than 1% when the inherent gain of the amplifier without feedback varies by 20%. Find the values of A_v and β.

Q3) An amplifier with an open-loop voltage gain of 1,000 delivers 10 W of output power at 10% second harmonic distortion, when the input signal is 10 mV. If 40 dB negative voltage-series feedback is applied and the output power is to remain at 10 W, determine (i)the required input signal (ii) percentage second harmonic distortion and(iii) closed loop voltage gain.

Q4) An R-C coupled amplifier has A_m=50,000; f_H= 20kHz; f_L= 30 Hz. A resistive voltage negative feedback is added such that $\beta=5 \times 10^{-5}$. Find A_{mf}, f_{Hf} and f_{Lf}.

Q5) For the given feedback amplifier circuit, h_{fe}= 100, h_{ie}= 1kΩ and negative h_{re} and h_{oe}. Find (i) $R_{mf}=\frac{V_o}{I_s}$ where $I_s=\frac{V_S}{R_S}$ (ii) $A_{vf}=\frac{V_o}{V_s}$

Q6) Do the feedback analysis of the following circuit to determine (i) A_v (ii) A_{vf} (iii) R_{in} (iv) R_{inf}

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

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Assignment Sheet

Sheet No:-1.6 **Name of Student:-**____________________________

Unit No:-1 **Unit Name: - Feedback Amplifiers**

Q1) An amplifier with negative feedback gives an output of 12.5 volts with an input of 1. 5V. When feedback is removed, it requires 0.25V input for the same output. Find the value of voltage gain without feedback.

Q2) An amplifier has a voltage gain of 40. The amplifier is now modified to provide a 10% negative feedback in series with the input. Calculate the amount of feedback in dB.

Q3) An amplifier with negative feedback has a gain of -100. It is found that without feedback an input signal of 50 mV is required to produce a given output whereas with feedback the input signal must be 0.06V for the same output. Calculate the value of β.

Q4) Derive an expression for the overall gain of a voltage series feedback amplifier. An amplifier has the midband gain of 1,500 and a bandwidth of 4 MHz. The midband gain reduces to 150 when a negative feedback is applied. Determine the value of feedback factor and the bandwidth.

Q5) An amplifier with voltage gain of 80dB uses $\frac{1}{40}$ of its output in negative feedback. Calculate the gain with feedback in dB

Q6). The circuit shown below has the following parameters:
R_c=2.2kΩ, R'=50 kΩ R_s=10kΩ,h_{ie}= 1.1kΩ,h_{fe}=50 and h_{re}=h_{oe}=0. Find (i) A_{vf} (ii) R_{if} and (iii) R'_{of}

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

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Assignment Sheet

Sheet No:-2.1 **Name of Student:-**________________________

Unit No:-2 **Unit Name:- Oscillators**

Q1) In a transistorized Hartley Oscillator, the tank circuit has the capacitance of 100 pF. The value of inductance between the collector and tapping point is 30 mH and the value of inductance between the tapping point and the transistor base is 1×10^{-8} H. Determine the frequency of oscillations.

Q2) Prove that ratio of the parallel to series resonant frequencies of crystal is given approximated by $\frac{f_P}{f_S} \cong \left(1+\frac{1}{2}\frac{C}{C'}\right)$, where C' = mounting capacitance. If C = 0.04 pF and C'= 2pF, by what percentage is the parallel resonant frequency greater than the series resonant frequency.

Q3) Design the R-C elements of a wien bridge oscillator for operation at f= 15 kHz; R_1= 15kΩ, R_2=200 kΩ R_3=400kΩ, R_4=200 kΩ and C_1= C_2= C.

Q4) A fixed bias binary (bistable) is obtained by connecting two transistors as inverters. The various circuit parameters are $V_{CC}=-V_{BB}$= 10V; $R_{C1}=R_{C2}$= 1.2k; $R_{B1}=R_{B2}$= 39k and $R_1=R_2$=10k. The transistors are made of silicon and have h_{fe}= 30. Compute stable currents and voltages. Neglect I_{CBO}.

Q5) In an practical emitter coupled astable multivibrator the various circuit parameters are: V_{CC}=30v, $R_2=2R_1<<R''$, C=0.1 μF R_{C2}= 0.22K, $R'=R''$=1.1K, $R_{e1}=R_{e2}$=3.3K. Calculate (a) The various voltage levels (b) Frequency of Oscillations. Assume silicon transistor with h_{fe}=30.

Q6) In a Hartley Oscillator, L_1= 15mH and C = 50pF. Calculate L_2 for a frequency of 168kHz. The mutual inductance between L_1 and L_2 is 5μH. Also find the required gain of the transistor to be used for oscillations.

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

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Assignment Sheet

Sheet No:-2.2 **Name of Student:-__________________________**

Unit No:-2 **Unit Name:- Oscillators**

Q1) A Tuned-Collector oscillator has a fixed inductance of 100 μH and has to be tunable over the frequency band of 500 kHz to 1,500 kHz. Find the range of variable capacitor to be used.

Q2) Calculate the value of inductance (L) offered by the crystal at oscillation frequency f_s= 1MHz.

Q3) Find the frequency of oscillations of a wien bridge oscillator with R= 20kΩ and C= 1,000 pF.

Q4) Calculate the stable state voltages and currents I_{C1}, I_{C2}, I_{B1}, I_{B2}, V_{B1}, V_{B2}, V_{C1} and V_{C2} for the bistable multivibrator, where $V_{BE(cutoff)}$=0.7V, $V_{CE(sat)}$=0.15V; R_{C1}= R_{C2}= 2.2k; R_{B1}=R_{B2}= 100k and R_1= R_2=1.5k. The transistors are made of silicon and have h_{fe}= 20

Q5) Calculate the operating frequency and feedback factor for the Harley Oscillator whose mutual inductance of coil is 20 μH, C= 20pF, L_1=100 μH, L_2= 1000 μH.

Q6). In a Colpitts Oscillator, the value of the inductors and capacitor in the tank circuit are L= 40mH, C_1=100pF and C_2= 500pF.

1) Find the frequency of oscillations.
2) If the output voltage is 10V, find the feedback voltage.
3) Find the minimum gain, if the frequency is changed by changing 'L' alone.
4) Find the value of C_1 for a gain of 10.
5) Also, find the new frequency of oscillation.

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

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Assignment Sheet

Sheet No:-2.3 **Name of Student:-**____________________

Unit No:-2 **Unit Name:- Oscillators**

Q1) In a Tuned-Collector Oscillator the applied voltage is 12V. The power output of the circuit is 88mW and total losses in the tank circuit are 8 mW. Determine the transformer winding turn-ratio. Assume g_m to be 10 mA/volt.

Q2) The parameters of a crystal oscillator equivalent circuit are L_S=0.8 H; C_S= 0.08 pF, R_S= 5kΩ and C_p= 1pF. Determine the resonance frequencies f_S and f_P.

Q3) An astable multivibrator circuit has the following parameters: R_1= R_2= 5kΩ; R_3=R_4= 0.4kΩ; C_1=C_2= 0.02μF. Determine (i) Time period and frequency of circuit oscillations. (ii) Minimum value of transistor β.

Q4) Calculate the component values of a monostable multivibrator using silicon *n-p-n* transistors, developing an output pulse of 120 μsec duration. Assume $(h_{fe})_{min}$=20. $I_{C(sat)}$=6mA, V_{CC}=6V and V_{BB}=-1.5 V. If r_{bb}= 150 Ω, calculate the magnitude of the overshoot.

Q5) If C= 0.04 pF and C_M= 2 pF then by what percent does the parallel resonant frequency exceed the series resonant frequency?

Q6) The frequency sensitive arms of the wien bridge oscillator uses C_1=C_2=0.001 μF and R_1=10kΩ while R_2 is kept available. The frequency is to be varied from 20kHz to 70kHz by varying R_2. Find the minimum and maximum values of R_2.

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

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Assignment Sheet

Sheet No:-2.4 **Name of Student:-**________________________

Unit No:-2 **Unit Name:-Oscillators**

Q1) The transistor Colpitts oscillator has the following parameters: L= 100 μH; L_{RFC}=0.6mH, C_1=0.001 μF, C_2=10 μF. Determine (i) Operating frequency, (ii) Feedback fraction (iii) minimum gain to sustain oscillations and emitter resistance if R_C= 2.5kΩ.

Q2) A crystal oscillator has the following parameters:

(i)Find f_S (ii) By what percent does the parallel resonant frequency exceed the series resonant frequency? (iii) find the Q of the crystal.

Q3) Design an astable multivibrator. The repetition rate is 500Hz and pulse width is 0.2mS. Use two transistors with h_{fe}=50. V_{CC} = V_{BB} = 20V, R_{C1} = R_{C2} = 1kΩ.

Q4) Calculate the stable state voltages and currents for the self biased bistable multivibrator which uses *n-p-n* silicon transistors. The various parameters of the circuit are V_{CC}=10 V, R_1=30 k, R_C= 4k, R_2=10k and R_E= 500Ω. Also find the minimum value of h_{fe} which will turn ON transistor in saturation.

Q5) Design a R-C phase shift oscillator to generate 5kHz sine wave with 20V peak to peak amplitude. Draw the designed

Q6) For phase shift oscillator, the feedback network uses R = 6K and C=1500pF. The transistorized amplifier used, has a collector resistance of 18 K. Calculate the frequency of oscillations and minimum value of h_{fe} of the transistor.

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

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Assignment Sheet

Sheet No:-2.5

Name of Student:-____________________

Unit No:-2

Unit Name:- Oscillators

Q1) A Hartley oscillator have the following parameters:

L_1= 500 μH, L_2= 5,000 μH, M=300 μH, C=150pF. Find frequency of oscillations.

Q2) In a phase shift oscillator $R_1=R_2=R_3$= 800 kΩ and $C_1=C_2=C_3$= 100pF. Determine the frequency of oscillation.

Q3) For the monostable multivibrator calculate the input pulse width for the design values of R_C= 2kΩ, R_B= 20kΩ, C= 0.1μF and V_{CC} = 12 V. Assume $V_{ce(sat)}$= 0.2 V, $V_{BE\,(sat)}$= 0.8V and β=50. Check-up the saturation of the transistor so that the circuit acts as a monostable multivibrator.

Q4) If an astable multivibrator is used to generate square wave using the component values as $C_1=C_2$=100pF and $R_1=R_2$=10 kΩ, Calculate the pulse width, period and frequency of output.

Q5) The parameters of a crystal oscillator equivalent circuit are L_S =0.8 H, C_S= 0.08pF, R_S= 5kΩ and C_M=1pF. Determine the resonating frequency f_s and f_p.

Q6) Find the resistance R and h_{fe} for the transistor to provide a resonating frequency of 5kHz of a transistorized phase shift oscillator. The biasing resistance are 25k and 47 k. The load resistance is 10k. The capacitor in the tank circuit is 1000pF while h_{ie} of the transistor is 2k.

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

Assignment Sheet

Sheet No:-2.6 **Name of Student:-**____________________

Unit No:-2 **Unit Name: - Oscillators**

Q1) The tuned collector oscillator makes use of an L-C tuned circuit with L= 29.3 μH and C= 450 pF. Determine the frequency of oscillation.

Q2) Calculate the value of C for the R-C elements of a wien bridge oscillator for operation at f= 15 kHz; R_1= 15kΩ R_2=200 kΩ and C_1= C_2= C.

Q3) Design a collector-coupled one shot multivibrator circuit using *n-p-n* transistors. Neglect I_{CBO} and junction voltages of the transistor in saturation. Let $h_{fe\,(min)}$ = 20. In stable state, the OFF transistor has V_{BE} = -1V. The ON transistor has base current I_B which is 50% in excess of the $I_{B(min)}$ value. V_{CC} =8V, $I_{C(sat)}$= 2 mA, delay time= 2,500 μsec. Choose R_1= R_2. I_{B2}(actual)= 1.5 $I_{B2(min)}$.

Q4) The fixed bias bistable multivibrator uses following parameters:

V_{CC}=12V, V_{BB}= -8V, R_1=10 K, R_2= 50K, R_C=2.2 K. The transistor are silicon transistor with a minimum value of h_{fe}=30. Calculate stable state currents and voltages when (i) All junctions voltages are neglected (ii) Assuming $V_{CE\,(sat)}$=0.2V and $V_{BE(sat)}$=0.7V.

Q5) A Hartley Oscillator having the following parameters:

L_1=500 μH, L_2= 5000 μH and C= 150pF. Find the frequency of oscillations.

Q6) A Quartz crystal has the following constants, L=50mH, C_1=0.02pF, R= 500Ω and C_2= 12pF. Find the values of f_s and f_p. If the external capacitance across the crystal changes from 5pF to 6pF, find the change in frequency of oscillations.

Question 1: An amplifier with negative feedback gives an output of 12.5 volts with an input of 1.5 V. When feedback is removed, It requires 0.25 V input for the same output. Find value of β, if the input and output are in phase and β is real.

a) 10%

b) 20%

c) 30%

d) **10.5%**

A current amplifier has an input resistance of 10 Ω, and an output resistance of 10 kΩ and a current gain of 1000. It is fed by a current source having a source resistance of 10 kΩ and its output is connected to a 10 Ω load resistance. Calculate its current gain.

990

989

998

950

The voltage gain of an amplifier without feedback is 3000. Calculate the voltage gain of the amplifier if the negative feedback is introduced in the circuit. Given that feedback fraction β=0.01.

96.77

95.00

97.88

96.44

Calculate the gain of a negative feedback amplifier with an internal gain A=75 and feedback fraction β = 1/15.

10

14

15

12.5

An amplifier has a voltage gain of 40. The amplifier is now modified to provide a 10% negative feedback in series with the input. Calculate voltage gain with feedback.

7

9

10

11

An amplifier with voltage gain of 60 dB uses 1/20 of its output in negative feedback. Calculate the gain with feedback.

17

18

19

19.6

Voltage gain of an amplifier without feedback is 60 dB. It decreases to 40 dB with feedback. Calculate the feedback factor.

6

7

8

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

9

An amplifier with negative feedback gives an output of 12.5 volts with an input of 1.5 V. When feedback is removed. It requires 0.25 V input for the same output. Find value of voltage gain without feedback, and (II) value of β, if the input and output are in phase and β is real.

40

50

60

70

A current amplifier has an input resistance of 10 Ω, and an output resistance of 10 kΩ and a current gain of 1000. It is fed by a current source having a source resistance of 10 kΩ and its output is connected to a 10 Ω load resistance. Calculate its voltage gain.

990

989

999

0

Calculate the gain of a negative feedback amplifier with an internal gain A=75 and feedback fraction β = 1/15.What will be the gain if A_v doubles?

13.65

13.00

15.52

19.00

An amplifier has a voltage gain of 40. The amplifier is now modified to provide a 10% negative feedback in series with the input. Calculate loop gain.

1

2

3

4

An amplifier with negative feedback gives an output of 12.5 volts with an input of 1.5 V. When feedback is removed, It requires 0.25 V input for the same output. Find value of voltage gain with feedback, if the input and output are in phase and β is real.

4

5

6

8

A feedback circuit usually employs ----------network.

Resistive

Inductive

Capacitive

All

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

Negative feedback in an amplifier

Reduces Bandwidth

Reduces gain

Increases frequency and phase distortions

Increases Noise

The feedback in Emitter Follower is

50%

0%

100%

45%

UNIT: 2 Oscillators & Multivibrators

Question 1: A Hartley Oscillator circuit has a tank circuit inductance of L1=L2=100μH. It is required to design the oscillator to produce oscillations at 50 KHz. Obtain the exact value of the tank circuit capacitance for the above said requirement.

a) **50.70nF**

b) 45.00nF

c) 56.85nF

d) 85.45nF

Question 2: Find the frequency of oscillations of a colpitt's oscillator if C_1=120pF, C_2=1.5nF and L_3=10μ H.

a) 3444 KHz

b) 2500 KHz

c) 4570 KHz

d) **4774 KHz**

Question 3: In phase shift oscillator R1= R2=R3=1 MΩ and C1=C2=C3=68 PF. Find the value of resonant frequency.

a) 450.6 Hz

b) 750.8 Hz

c) **740.5 Hz**

d) 850.9 Hz

Question 4: A Wien bridge oscillator is used for operate at f_0 =10 KHz. If the value of R is 100 KΩ, Find the value of the capacitor C.

a) 165 nF

b) **159 nF**

c) 175 nF

d) 184 nF

Question 5: The a.c. equivalent of a crystal has L=1H, C=0.01 pF, R=1000Ω and C_m=10 pF Calculate f_1 and f_2 where f_1 is series resonant frequency and f_2 parallel resonant frequency.

a) f1 = 1500 KHz : f2 = 1600 KHz

b) f1 = 1550 KHz : f2 = 1650 KHz

c) **f1 = 1591 KHz : f2 = 1670 KHz**

d) f1 = 1491 KHz : f2 = 1570 KHz

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

Question 6: In a transistor Colpitts oscillator L = 100μH. L_{RFC}= 0.6mH. C_1=0.001μF. C_2= 0.01μF and Cc=10 μF. Determine (1) Operating Frequency (2) Feedback Fraction

a) F= 520 KHz: h_{fe} = .4

b) F= 530 KHz: h_{fe} = .3

c) F= 540 KHz: h_{fe} = .2

d) F= 528 KHz: h_{fe} = .1

Question 7: A Hartley oscillator is designed with L_1= 2mH, L_2= 20μH and a variable capacitance. Determine the range of capacitance values, if the frequency of oscillation is varied between 950 and 2050 KHz.

a) 3.00pF to 14.9pF

b) 3.98pF to 15.9pF

c) 2.98pF to 13.9pF

d) 4.98pF to 16.9pF

Question 8: In a transistorized Hartley oscillator, if L_1= 0.1mH, L_2=10μH and mutual inductance between two coils M =20μH, Calculate the value of capacitor C_1 of oscillatory circuit to obtain frequency of 4110 KHz.

a) 20pF

b) 10pF

c) 40pF

d) 50pF

Question 9: If Barkhausen criterion is not fulfilled by an oscillator circuit, it will

a) Stop Oscillation

b) Become an amplifier

c) Produce damped waves continuously

d) Produce high frequency whistles

Question 10: The frequency of oscillation of an astable multivibrator depends mainly on the

a) Value of collector load resistors

b) Value of transistors

c) Width of the input pulse

d) RC values of the circuit

Question 5: An FET RC phase shift oscillator shown in Fig. 2.39 is required to oscillate at 1 kHz. JFET used has gm = 5 m mhos and rd = 20 k Ω if R = 10 k. Find the value of

(a) Capacitor is RC network

(b) External lead resistance RD

Question 5: In a transistor colpitt,s oscillator, C1= 0.001 μF ; C2= 0.01 μF and L=5 μH , Find the required gain for oscillation and the frequency of oscillation.

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

<u>Unit: 4 Tuned Amplifiers</u>

Q. 1 A tuned amplifier has its maximum gain at frequency of 5MHz and has a bandwidth of 50KHz. Calculate the Q-Factor.

100

200

300

400

Q. 2 A tank circuit has a capacitor of 100pF and an inductor of 150µH. The series resistance is 15Ω.What is the impedance of the resonant circuit.

200 KΩ

400 KΩ

600 KΩ

100KΩ

Q. 3 A tank circuit has a capacitor of 100pF and an inductor of 150µH. The series resistance is 15Ω.What is the Q factor of the resonant circuit.

80

82

[illegible]5

81.5

Q. 4 A tank circuit has a capacitor of 100pF and an inductor of 150µH. The series resistance is 15Ω.What is the Bandwidth of the resonant circuit.

14.28 KHz

16.45 KHz

15.90 KHz

18.84 KHz

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

Q. 5 A Class C tuned amplifier has C=600pF and L=25μH. The coil has a resistance 20Ω and load resistance is 2MΩ. Calculate the resonant frequency.

1.1 MHz

1.2 MHz

1.3 MHz

1.4 MHz

Q. 6 A Class C tuned amplifier has C=600pF and L=25μH. The coil has a resistance 20Ω and load resistance is 2MΩ. Calculate the quality factor.

10.5

20.8

10.2

12.5

Q. 7 A parallel resonant circuit has a capacitor of 100pF in one branch and an inductance of 100μH plus a resistance of 10Ω in the parallel branch. If the supply voltage is 100 V, calculate resonant frequency.

1.40 MHz

1.60 MHz

1.70 MHz

1.80 MHz

Q. 8 A parallel resonant circuit has a capacitor of 100pF in one branch and an inductance of 100μH plus a resistance of 10Ω in the parallel branch. If the supply voltage is 100 V, calculate Inductive Current.

.1 A

.2 A

.3 A

.4 A

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

Q. 9 A parallel resonant circuit has a capacitor of 100pF in one branch and an inductance of 100μH plus a resistance of 10Ω in the parallel branch. If the supply voltage is 100 V, calculate Capacitive Current.

.06 A

.08 A

.09 A

1.01 A

Q. 10 A circuit is resonance at 455 KHz and has a 10 KHz bandwidth. The inductive reactance is 1255Ω. What is the parallel impedance of the circuit at resonance?

[illegible]0 KΩ

57 KΩ

63 KΩ

77 KΩ

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

Unit: 5 Power Amplifiers

For a single stage class A amplifier Vcc = 20 Volt, VCEQ = 10 V, ICQ = 600mA and RC = 16Ω. The ac outputcurrent varies by + 300mA, with the ac input signal.

Q. 1 Calculate D.C. Power input to amplifier for above mention class A amplifier parameters.

8 Watts

10 Watts

12 Watts

15 Watts

Q. 2 Calculate D.C. Power consumed by the load resistor for above mention class A amplifier parameters.

5 Watts

5.50Watts

5.75 Watts

6 Watts

Q. 3 Calculate D.C. Power delivered to transistor for above mention class A amplifier parameters.

6 Watts

6.25 Watts

6.50 Watts

7 Watts

Q. 4 Calculate A.C. Output Power for above mention class A amplifier parameters.

0.25 Watts

0.52 Watts

0.72 Watts

0.82 Watts

Q. 5 Calculate Collector efficiency for above mention class A amplifier parameters.

10 %

11.5 %

12 %

12.5 %

Q. 6 Calculate Overall efficiency for above mention class A amplifier parameters.

3 %

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

4 %

5 %

6 %

Q. 7 A sinusoidal voltage Vs = 1.95 sin 400 t is applied to a power amplifier. The resulting current is ic = 12 sin 400 t + 1.2 sin 800 t + 0.9 sin 1200 t + 0.4 sin 1600 t. Calculate the total harmonic distortion.

11.8 %

12.9 %

13.5 %

14.6 %

Q. 8 A sinusoidal voltage Vs = 1.95 sin 400 t is applied to a power amplifier. The resulting current is ic = 12 sin 400 t + 1.2 sin 800 t + 0.9 sin 1200 t + 0.4 sin 1600 t. Calculate the percentage increase in power because of distortion.

1.50 %

1.66 %

2.25 %

2.63 %

Q. 9 A push pull Class B power amplifier uses the ideal transformer having a total of 160 turns on the primary and 40 turns on the secondary. It must be capable of delivering 40W power to the 8W speaker under maximum condition. How much should be the value of VCC.

25 Volts

50 Volts

75 Volts

100 Volts

A compementary symmety, Class AB Power amplifier uses two matched BJT and a dual power supply of 30 V and feeds a common load of 8 Ω. If the input voltage to this amplifier is 8 V_{rms}.

Q. 10 Calculate D.C. Power input to amplifier for above mention class AB amplifier parameters.

22 W

25 W

27 W

30 W

Q. 11 Calculate A.C. Output Power for above mention class AB amplifier parameters.

5 W

6 W

7 W

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

8 W

Q. 12 Calculate efficiency for above mention class AB amplifier parameters.

25.50 %

26.50 %

28.50 %

29.50 %

Q. 13 Calculate Power dissipation by both transistors for above mention class AB amplifier parameters.

15 W

18 W

19 W

20 W

Q. 14 The main purpose of using transformer coupling in a Class A amplifier is to make it more:

Distortion free

Bulky

Costly

Efficient

Q. 15 Class AB operations is often used in power amplifier in order to:

Get maximum efficiency

Remove even harmonics

Overcome Cross- Over distortion

Reduced collector disspiation

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

UNIT-1

Feedback Amplifiers

1. An RC coupled amplifier has a voltage gain of 1000, f_1 = 50Hz, f_2 = 200 KHz and a distortion of 5% without feedback. Find the amplifier voltage gain, lower and upper frequencies and distortion when a negative feedback is applied with feedback ratio 0.01. [RTU 2011]

2. If an amplifier has a bandwidth of 200 KHz and a voltage gain of 100, what will be the new bandwidth and gain if 5% negative feedback is introduced? What is the product of gain and bandwidth before and after adding negative feedback? What should be the amount of feedback if the bandwidth is restricted to 1MHz? [RTU 09]

3. Draw the block diagram of amplifier with negative feedback. Explain in brief, each block and its function. [Raj. Univ. 2008, 2011]

4. Explain Voltage Series feedback topology.

5. For the voltage shunt amplifier, prove that the voltage gain of the amplifier with feedback is given by $-R/R_S$. [Raj. Univ., 2002, 1998, 2009]

6. An amplifier with open loop voltage gain A = 1000 ± 100 is available. It is required to have an amplifier whose voltage gain varies by no more than ±0.1%.

1. Find the value of the feedback factor required.
2. Find the gain with feedback [IES, 2000]

7. What do you mean by feedback in amplifiers? Explain how negative feedback in an amplifier helps in reducing the distortion and noise. [RTU 2011, 2009]

8. Calculate the bandwidth, input impedance and output impedance of a negative feedback amplifier. [RTU 2011]

9. State and explain Nyquist stability criterion for feedback amplifiers. [RTU 2008]

10. An amplifier has a voltage gain of 40. The amplifier is now modified to provide a 10% negative feedback in series with the input. Calculate:

1. Voltage gain with feedback
2. Amount of feedback in dB
3. Loop gain [Raj. Univ., 2003]

11. Distinguish between voltage series feedback and current series feedback. Explain briefly with suitable circuit diagrams. [Raj. Univ., 2004]

13. Explain the effect of resistance on different feedback topologies.

14. Explain Current Shunt feedback topology.

Bhawna kumawat

[redacted], Assistant Professor, PCE

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

UNIT-2

Oscillators

1. A Hartley oscillator circuit has a tank circuit inductance of $L_1 = L_2 = 100\mu H$. It is required to design the oscillator to produce oscillations at 50 KHz. Obtain the exact value of the tank circuit capacitance for the above said requirements. [RTU-2009]

2. Find the frequency of oscillations of a colpitt's oscillator if $C_1 = 120pF$, $C_2 = 1.5Nf$ and $L_3 = 10\mu H$. [RTU 2009]

3. What do you understand by an electronic oscillator? Draw block diagram of an oscillator and explain. [RTU 2011]

4. Draw the circuit of the wein bridge oscillator. Derive the expression for frequency of oscillation for such an oscillator. [Raj. Univ., 2003, 2009, 2010, 2011]

5. A monostable multivibrator is to have an output pulse of 1μ sec. duration and 10mA amplitude. Given $h_{fe} = 20$ and reverse bias of $V_{B2} = 2$ volts for the OFF transistor and when ON, the transistors saturate. Determine R_C, R_1, R_2 and C. Assume $V_{CC} = V_{BB} = 5$volts.

6. In a transistor Colpitts oscillator $L = 100\ \mu H$, $L_{RFC} = 0.6$ Mh, $C_1 = .001\mu F$, $C_2 = 0.01\mu F$ and $C_C = 10\mu F$. Determine

   I. Operating frequency
   II. Feedback fraction
   III. Minimum gain to sustain oscillations and
   IV. Emitter resistance if $R_C = 2.5K\Omega$.

7. Describe the working of a monostable multivibrator with the help of suitable diagram using BJT and also show the waveforms at various points and derive expression for time width. [Raj. Univ.,2003, 2002, 2001, 2000, 2010, 2011]

8. Draw the circuit of RC phase shift oscillator and deduce the expression for condition of sustained oscillation and frequency of oscillation. [Raj. Univ. 2009]

9. The parameters of a crystal oscillator equivalent circuit are $L_S = 0.8H$, $C_S = 0.8pf$, $R_S = 5K\Omega$ and $C_p = 1.0pf$. Determine the resonance frequencies f_s and f_p. [Raj. Univ. 2003]

10. A crystal has the following parameters: series inductor L = 0.33 H, series capacitor C = 0.065pf, parallel capacitor C' = 1.0 pF, series resistor R= 5.5KΩ,

    I. Find f_s

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II. By what percent does the parallel resonant frequency exceed the series resonant frequency

III. Find Q of the crystal

11. Select the value of capacitor C and transistor gain h_{fe} to provide an RC phase shift oscillator frequency of f_0 = 10KHz. The circuit values are h_{ie} = 2K, R_1 = 22 KΩ; R_2 = 68 KΩ; R_C = 20 KΩ, R = 6.8 KΩ. Find the value of feedback resistor R_s.

12. Draw the schematic diagram of Schmitt trigger and explain its working as a binary. [RTU 2009]

13. What do you understand by an electronic oscillator? Draw block diagram of an oscillator and explain. [RTU 2011]

14. An astable multivibrator circuit has the following parameters: $R_3 = R_2$ = 5kΩ., $R_1 = R_4$ = 0.4kΩ $C_1 = C_2$ = 0.02μF

Determine:

I. Time period and frequency of oscillations

II. Minimum value of transistor β.

UNIT 3

HIGH FREQUENCY AMPLIFIERS

1. Draw the neat diagram of hybrid-π model for a transistor at high frequency in CE configuration, discuss in brief. [RTU 08, 09 Raj. Univ. 02, 03]

2. Explain the significance of two capacitors and all resistive components of each parameter in hybrid- π model. [Raj. Univ. 2000, 1998, 07, RTU 08,09]

3. What are the merits of high frequency hybrid- π model? [Raj. Univ. 2002]

4. In a hybrid- π model, prove that diffusion capacitance at emitter junction

$C_{de} = (g_m)(W^2)/(2D_B)$

Where g_m = transistor Transconductance

W = base-width

D_B = diffusion constant for minorities in base [Raj. Univ. 03, 07]

5. Derive the equation for g_m, which gives relation between g_m, I_c and temperature. [RTU 2008]

6. Derive expression for CE short circuit current gain A_i as a function of frequency. [RTU 2008, 2009]

7. Define f_T in a hybrid- π model for a single transistor and prove that:

$F_t = (g_m)/(2\pi C_e)$

Where C_e = diffusion capacitance [Raj. Univ. 2007]

8. Derive the expression for CE short circuit current gain as a function of frequency. Define $f\beta$ and f_T. Also find the relation between $f\beta$ and f_T. [RTU 2009]

9. Derive the expression for CE current gain and voltage gain including source resistance R_s.

10. Draw the neat diagram of hybrid- π model of an emitter follower and derive the expression for high frequency voltage gain. [Raj. Univ. 01, 04, 99, 11]

11. Draw the high frequency equivalent circuit of an emitter follower and derive the expression of upper cut-off frequency, f_H for the same. [Raj. Univ. 03, 11]

12. Discuss hybrid- π model of an emitter follower circuit. [Raj. Univ. 2007]

13. Write short note on emitter follower at high frequency. [RTU 08, 06]

14. Determine gain bandwidth product, unity gain frequency using hybrid- π model for CE configuration. [RTU 2008,2011]

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15. Discuss high frequency response of single case CE amplifier with resistive load and deduce the expression of voltage gain- bandwidth product. Why is 3dB frequency for current gain not same as f_H for voltage gain. [RTU 2008]

16. Draw the hybrid- π model for CE configuration. Express its parameters in turns of hybrid parameter in π mode. [RTU 2008]

17. Show the variation of hybrid- π model parameter with temperature I_c and voltage $|V_{ce}|$. Give the reason also of capacitance variation with temperature. [RTU 2008]

UNIT 4

TUNED AMPLIFIERS

1. A tuned amplifier has its maximum gain at a frequency of 5MHz and has a bandwidth of 50 kHz. Calculate the Q-factor.

2. A tank circuit has a capacitor of 100 pF and an inductor of 150 μH. the series resistance is 15Ω. Find the impedance, Q and bandwidth of the resonant =circuit.

3. A FET having g_m = 6 mA/V has a tuned anode load consisting of a 400 μH inductance of 5 Ω in parallel with a capacitor of 2500 pF. Find

i. The resonant frequency

ii. Tuned circuit dynamic resistance

iii. Gain at resonance

iv. The signal bandwidth

4. In a double tuned circuit K = 2 kc and $Q_1 = Q_2$=80. If f_0 = 10.7 MHz.

I. What are the frequencies of peak response?

II. What is the 3dB bandwidth of the circuit with ripple of 3 dB?

[RTU 2011]

5. Draw and explain the circuit of double tuned amplifier with the help of frequency response. [RTU 2010]

6. Write short note on Doubled tuned amplifier. [RTU 2007]

7. Give merits and demerits of tuned amplifiers. [RTU 2009, 2010]

8. Draw the single tuned amplifier using FET. Also derive the expression for bandwidth. [RTU 2010]

9. What is stagger tuned amplifier? Explain the frequency response of stagger tuned amplifier. [RTU 2008, 2009, 2010]

10. Determine the shape modification in a rectangular pulse when:

i. Amplifier is wide band

ii. Amplifier is narrow band [RTU 2008]

11. Draw the parallel resonant circuit; obtain the expression for its bandwidth. [RTU 2009, 2010]

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UNIT 5

POWER AMPLIFIERS

1. For a single stage class-A amplifier, V_{cc} = 20 volt, V_{CEQ} = 10 volt, I_{CQ} = 600 mA and collector load resistor R_L = 16 Ω. The ac output current varies by ±300mA, with the ac input signal. Determine:

i. Power supplied by the dc source to amplifier or dc power input to amplifier
ii. DC power consumed by the load resistor
iii. Output power ac or ac power developed across the load resistor
iv. Collector efficiency
v. Overall efficiency

2. A sinusoidal voltage V_s = 1.95 sin 400 t is applied to a power amplifier. The resulting current is i_c = 12 sin 400 t + 1.2 sin 800 t + 0.9 sin 1200 t + 0.4 sin 1600 t. Calculate:

i. The total harmonic distortion
ii. The percentage increase in power because of distortion [RTU 2011]

3. A complementary symmetry, class AB, A.F. power amplifier uses two matched BJT and a dual power supply of ±30V, and feeds a common load of 8 Ω. If the input voltage to this amplifier is $8V_{rms}$, calculate:

i. DC power input
ii. AC power output
iii. Maximum possible ac power output
iv. Efficiency

4. A class C transistor amplifier is operating at 150 kHz. The transistor is conducting for 1μs in each cycle. The saturation values for the transistor are:

$I_{C\,Sat}$ = 100mA; $V_{CE\,Sat}$ = 0.2V

Assuming ideal pulse approximation and the output swinging over the entire load line, find the average power dissipation. [IES, 2003]

5. In a class B push-pull amplifier, prove that

$P_{c,\,max} = (4/\alpha^2)\,P_{max}$

P_{max} = maximum power output [RTU 2007]

6. For a class A CE transistor amplifier, the operating point is located at I_c = 250 mA and V_{CE} = 8V. Due to the output signal, the output current goes in between 450 mA and 40 mA while the V_{CE} swing between 15V to 1V. find

Dr. Mahesh Bundele
B.E., M.E., Ph.D.
Director
Poornima College of Engineering
ISI-6, RIICO Institutional Area
Sitapura, JAIPUR

i. The output power delivered
ii. The input power
iii. The collector efficiency
iv. The power dissipated by transistor

7. Give the circuit of a transformer coupled single transistor output stage and explain the need for matching the impedance. [RTU 2008, 2009]

8. Explain a push pull amplifier using a typical circuit. Explain why even harmonics are not present in the amplifier? [RTU 2007,2008,2009,2011]

9. What are the advantages of push pull amplifier over that of a single transistor amplifier? [RTU 2009]

10. Derive an expression for the output power of an idealized class-B push pull amplifier and show that its maximum efficiency is 78.5%. [RTU 2008, 2009, 2010]

11. Show that optimum conversion efficiency possible in a class B push pull amplifier is 78.5% and also explain the main drawback of class B configuration in power amplifier. [RTU 2010]

12. What do you understand by class A, B and C power amplifiers? [RTU 2011]

13. Show that maximum collector efficiency of a class A transformer coupled power amplifier is 50%. [RTU 2011]

14. Draw the schematic circuit diagram of complimentary symmetry power amplifier. [RTU 2007, 2010]

15. Wrote short note on push pull amplifier. [RTU, 2009]

16. Define and explain the following term as applied to power amplifier:

i. Collector efficiency
ii. Power dissipation capability
iii. Overall gain [RTU 2011]

17. Derive an expression for the output power of class A large signal amplifier in terms of V_{max}, V_{min}, I_{max} and I_{min}. [RTU 2011]

18. Explain the general features of audio power amplifier. Also explain the working of class A power amplifier. [RTU 2009]