NARASIMHA REDDY ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad

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ELECTRICAL AND ELECTRONICS ENGINEERING

QUESTION BANK

Course Title : ANALOG ELECTRONIC CIRCUITS

Course Code : 23EC309

Regulation : NR23

Course Objectives:

- To introduce components such as diodes, BJTs and FETs their switching characteristics, applications.
- Learn the concepts of high frequency analysis of transistors.
- To give understanding of various types of basic and feedback amplifier circuits such as small signal, cascaded, large signal and tuned amplifiers.
- To introduce the basic building blocks of linear integrated circuits.
- To introduce the concepts of waveform generation and introduce some special function ICs

Course Outcomes (CO's): At the end of this course, students will demonstrate the ability to

- Know the characteristics, utilization of various components.
- Understand the biasing techniques.
- Design and analyze various rectifiers, small signal amplifier circuits.
- Design sinusoidal and non-sinusoidal oscillators.
- A thorough understanding, functioning of OP-AMP, designs OP-AMP based Circuits with linear integrated circuits.

UNIT-I

DIODE AND BIPOLAR TRANSISTOR CIRCUITS

PART-A (SHORT ANSWER QUESTIONS)

S.No	Question	BT	CO	PO
1.	What do you mean by diode?	Remember	CO1	PO1,PO12
2.	Explain about forward bias of diode?	Understand	CO1	PO1,PO12
3.	Explain about reverse bias of diode?	Understand	CO1	PO1,PO12
4.	Write the Applications of diode?	Remember	CO1	PO1,PO12
5.	Draw the V-I characteristics of diode?	Remember	CO1	PO1,PO12

6.	Define cut-in voltage?	Remember	CO1	PO1,PO12
7.	Mention different names for cut-in voltages and its values for Si,Ge.	Remember	CO1	PO1,PO12
8.	Define rectifier?	Remember	CO1	PO1,PO12
9.	Give the broad classification of rectifiers.	Understand	CO1	PO1,PO12
10.	What do you mean by clipper?	Understand	CO1	PO1,PO12
11.	Define clamper.	Remember	CO1	PO1,PO12
12.	How many types of clampers are there?	Remember	CO1	PO1,PO12
13.	Define Transistor?	Remember	CO1	PO1,PO12
14.	What is meant byoperating point(Q)?	Understand	CO1	PO1,PO12
15.	Draw the symbols of NPN and PNP transistor?	Remember	CO1	PO1,PO12
	PART-B (LONG ANSWER QUESTIONS)			
1.	Explain the operation of p-n junction diode under forward and reverse bias conditions and Sketch the V-I characteristics.	Remember	CO1	PO1,PO12
2.	Explain the operation of anytwo rectifiers with neat output waveforms.	Remember	CO1	PO1,PO12
3.	Explain the operation of clamper circuits with neat output Waveforms.	Remember	CO1	PO1,PO12
4.	With thehelp of a neat circuit diagram explain the working of two level diode clippers.	Remember	CO1	PO1,PO12
5.	With neat circuit diagram explain the input and output characteristics of BJT in CB configuration.	Remember	CO1	PO1,PO12
6.	With neat circuit diagram explain the input and output characteristics of BJT in CE configuration.	Understand	CO1	PO1,PO12
7.	With neat circuit diagram explain the input and output characteristics of BJT in CC configuration.	Remember	CO1	PO1,PO12
8.	With the help of neat circuit diagram explain the operation of self bias circuit.	Remember	CO1	PO1,PO12
9.	Derive the expressions for voltage gain, current gain, input impedance and output impedance of CE amplifier.	Remember	CO1	PO1,PO12
10.	Derive the expressions for voltage gain, current gain, input impedance and output impedance of CB amplifier.	Remember	CO1	PO1,PO12
	PART-C (ANALYTICAL QUESTIONS)			
1.	What is meant byQ-point? Also explain the need for biasing a transistor.	Remember	CO1	PO1,PO12
2.	Draw the fixed bias circuit and derive an expression for the Q-factor.	Remember	CO1	PO1,PO12
3.	Draw the voltage divider bias circuit and derive an expression forthe Q-factor.	Remember	CO1	PO1,PO12
	UNIT-II **FET CIRCUITS**			
	PART-A (SHORT ANSWER QUESTIONS)			
1.	Draw the drain characteristics of depletion type MOFET?	Understand	CO2	
2.	What is MOSFET?	Understand	CO2	
3.	What are the regions of operation of a MOSFET?	Understand	CO2	
4.	Draw the I-V characteristic of MOSFET.	Remember	CO2	
5.	Draw the circuit symbol of N-channel MOSFET.	Remember	CO2	

6.	Draw the drain characteristics of n-channel enhancement typeMOSFET?	Remember	CO2	
7.	Draw the circuit symbol of P-channel MOSFET.	Remember	CO2	
8.	Define rd and gm?	Remember	CO2	
9.	How MOSFET can acts as switch?	Remember	CO2	
10.	Draw the circuit diagram of CS amplifier.	Remember	CO2	
11.	Draw the circuit diagram of CD amplifier.	Remember	CO2	
12.	Draw the circuit diagram of CG amplifier.	Remember	CO2	
13.	Define trans conductance.	Remember	CO2	
14.	Define Pinch-off region.	Remember	CO2	
15.	Define Ohmic region.	Remember	CO2	
PART-B(LONG ANSWER QUESTIONS)				
1.	Explain the construction & operation of a P-channel MOSFET inenhancement and depletion modes with the help of static drain characteristics and transfer characteristics?	Understand	CO2	
2.	Sketch the drain characteristics of MOSFET for different values of VGS & mark different regions of operation.	Understand	CO2	
3.	Explain the principle of CS amplifier with the help of circuit diagram. Derive the expressions for AV, input impedance and output Impedance?	Remember	CO2	
4.	Draw the small-signal model of common drain FET amplifier. Derive expressions for voltage gain and output resistance?	Remember	CO2	
5.	Draw the small-signal model of common source FET amplifier.Derive expressions for voltage gain and output resistance?	Remember	CO2	
6.	Draw the small-signal model of common gate FET amplifier. Derive the expressions for voltage gain and output resistance?	Remember	CO2	
7.	List any four merits of MOSFET to show that they are more suitable than JFETS in Integrated circuits?	Understand	CO2	
8.	Compare enhancement and depletion modes of a MOSFET with the help of its characteristics and construction?	Understand	CO2	
9.	Derive the expression for trans conductance of MOSFET?	Understand	CO2	
10.	Define pinch-off voltage and trans conductance in field effect transistors? Also mention the differences between BJT & FET.	Remember	CO2	
PART-C (ANALYTICAL QUESTIONS)				
1.	Define the three FET parameters: gm, rd and μ. Prove that μ=gm xrd.	Remember	CO2	

2.	Explain the construction and principle of operation of Depletion type N-channel MOSFET.	Remember	CO2	
3.	Compare Depletion MOSFET and enhancement MOSFET. Also Derive the expression for trans conductance in a CS field effect transistor.	Remember	CO2	
4	For the circuit shown in fig. Determine i) Input impedance II) output impedance and III)Voltage gain?	Remember	CO2	
5	Explain the construction and principle of operation of Depletion type P-channel MOSFET.	Understand	CO2	
6	Explain the construction and principle of operation of Enhancement type P-channel MOSFET.	Understand	CO2	
	UNIT-III **MULTI-STAGE AND POWER AMPLIFIERS**			
	PART-A (SHORT ANSWER QUESTIONS)			
1.	What is meant by band width?	Remember	CO3	
2.	List the classification of amplifiers.	Remember	CO3	
3.	What are the merits and demerits of a cascade amplifier over A simple CE amplifier?	Understand	CO3	
4.	Define distortion.	Remember	CO3	
5.	How many types of coupling schemes are there?	Understand	CO3	
6.	What are the advantages of multistage amplifiers?	Understand	CO3	
7.	Classify power Amplifiers.	Remember	CO3	
8.	What are the advantages of class-B power amplifier?	Understand	CO3	
9	Define power amplifier.	Remember	CO3	
10.	What do you mean by Gain band width product?	Remember	CO3	
11.	Define differential amplifier.	Remember	CO3	
12.	What are the drawbacks in Class A power amplifier?	Understand	CO3	
13	Define frequency response.	Remember	CO3	
	PART-B (LONG ANSWER QUESTIONS)			
1.	Explain about different types of distortions that occur in amplifier circuits.	Understand	CO3	
2.	Explain the two stage amplifier with RC coupled amplifier. Give the advantages of this circuit.	Remember	CO3	
3.	Compare the different types of coupling methods used in multistage amplifiers.	Understand	CO3	
4.	Define the terms collector dissipation and conversion efficiency of class A power amplifier.	Understand	CO3	
5.	In a modified class B power amplifier cross over, how distortion can be eliminated?	Understand	CO3	

6.	Briefly explain about Direct Coupled Amplifier with neat sketches.	Understand	CO3	
7.	State the advantages of push pull class B poweramplifier over class B power amplifier.	Remember	CO3	
8.	Draw the push-pull class-B power amplifier and explain its Operation. Show that the maximum conversion efficiency is78.5%.	Remember	CO3	
9.	Compare different power amplifiers.	Remember	CO3	
10.	What are the advantages and disadvantages of transformer coupling?	Remember	CO3	
	PART-C (ANALYTICAL QUESTIONS)			
1	Draw the circuit diagram of Direct coupled class-A power amplifier and explain its operation. Show that the maximum conversion efficiency is 25%.	Remember	CO3	
2	A single transistor is acting as ideal Class B amplifier with load of 1KΩ, if DC collector current is 15mA, VCC=20V. Determine its efficiency.	Remember	CO3	
3	Draw the circuit diagram of class B push pull power amplifier and derive an expression for its conversion efficiency.	Remember	CO3	
4	Draw the circuit diagram of class-B power amplifier and explain its operation. Show that the maximum conversionefficiency is 78.5%.	Remember	CO3	
5	Explain the two stage amplifier with CE-CC configuration. Give the advantages of this circuit.	Understand	CO3	
	UNIT-IV **FEEDBACK AMPLIFIERS AND OSCILLATORS**			
	PART-A (SHORT ANSWER QUESTIONS)			
1.	Define feedback amplifier.	Remember	CO4	
2.	What is meant by positive and negative feedback?	Remember	CO4	
3.	What are the advantages and disadvantages of negative feedback?	Understand	CO4	
4.	How many types of topologies in negative feedback amplifiers?	Remember	CO4	
5.	Define sensitivity.	Remember	CO4	
6.	Define De-sensitivity.	Remember	CO4	
7.	Differentiate between voltage and current feedback in amplifiers.	Remember	CO4	
8.	What is Oscillator circuit?	Understand	CO4	
9.	What are the classifications of Oscillators?	Understand	CO4	
10.	What are the conditions for oscillations?	Understand	CO4	
11.	What are the RC oscillators?	Understand	CO4	
12.	What are the LC oscillators?	Understand	CO4	
13.	Draw the circuit diagram of Hartley oscillator.	Remember	CO4	
14.	Draw the circuit diagram of Colpitts oscillator.	Remember	CO4	
15.	Calculate the frequencyof oscillation for the Colpitts oscillator with c1=0.1μf, c2=1μf, c3=100pF and L=470μH.	Remember	CO4	
	PART-B (LONG ANSWER QUESTIONS)			

1.	Explain the concept of feedback as applied to electronic amplifier circuits. What are the advantages & disadvantages of positive and negative feedback?	Understand	CO4	
2.	Derive an expression for frequency oscillation of Hartley oscillator using transistor.	Remember	CO4	
3.	What type of feedback is used in electronic amplifiers? What are the advantages of this type of feedback? Prove each one mathematically.	Understand	CO4	
4.	Give the equivalent circuits, and characteristics of ideal and practical amplifiers of the following types (i) Voltage amplifier,(ii) Trans-resistance amplifier.	Understand	CO4	
5.	Derive the expression for the input resistance with feedback Rif and output resistance with feedback Rof in the case of (a) Voltage series feedback amplifier. (b) Voltage shunt feedback amplifier.	Understand	CO4	
6.	Draw the circuit for Voltage series amplifier and justify the type of feedback. Derive the expressions for Av, Ri and Ro for the circuit.	Remember	CO4	
7.	Draw the circuit and explain the principle of operation of RC phase-shift oscillator circuit. What is the frequency range of generation of oscillations? Derive the expression for the frequency of oscillations.	Remember	CO4	
8.	Derive the expression for the input resistance with feedback Rif and output resistance with feedback Rof in the case of (a)current series feedback amplifier. (b) current shunt feedback amplifier.	Remember	CO4	
9.	Derive an expression for frequency oscillation of Colpitts oscillator using transistor.	Understand	CO4	
10.	Draw the circuit diagram of Wein bridge oscillator using BJT and derive the expression for frequency of oscillations.	Remember	CO4	
	PART-C (ANALYTICAL QUESTIONS)			
1.	In Hartley oscillator, if L1=0.2mH, L2=0.3mH and C=0.003 μF, calculate the frequency of its oscillation.	Remember	CO4	
2.	Calculate the gain, input impedance, output impedance of voltage series feedback amplifier having A=300, Ri=1.5K,RO=50K and β =1/12.	Remember	CO4	
3.	A Hartley oscillator is designed with L = 20μH and a variable capacitance. Find the Range of capacitance values if the frequency of oscillation is varied between 950 KHz to 2050 KHz.	Remember	CO4	
4	An amplifier has a mid band gain of 125 and bandwidth of 250 kHz. If 4% negative feedback is introduced, find the new bandwidth and gain.	Remember	CO4	
5	An amplifier with Av = - 500, produces 5% harmonic distortion at full output. What value of β is required to reduce the distortion to 0.1 %? What is the overall gain?	Remember	CO4	
6	What are the advantages of negative feedback? Prove each one mathematically?	Remember	CO4	
7	For a voltage series feedback amplifier Find D, Avf, Rif, Rof .	Remember	CO4	
8	A Colpitts oscillator is designed with capacitance C = 20μF and a variable inductance. Find the Range of capacitance values if the frequency of oscillation is varied between 1000 KHz to 2000 KHz.	Remember	CO4	
	UNIT-V **OPERATIONAL AMPLIFIERS**			
	PART-A (SHORT ANSWER QUESTIONS)			
1.	Define an operational amplifier.	Remember	CO5	
2.	Mention the characteristics of an ideal op-amp.	Remember	CO5	
3.	Define input offset voltage.	Remember	CO5	
4.	Define Output offset voltage.	Remember	CO5	

5.	Define input bias current.	Remember	CO5	
6.	Define slew rate.	Remember	CO5	
7.	Define an integrator.	Remember	CO5	
8.	Define differentiator circuit.	Remember	CO5	
9.	What are the two configuration of op-amp?	Understand	CO5	
10.	What is an integrated circuit?	Understand	CO5	
11.	What is an inverting amplifier?	Understand	CO5	
12.	What is a non-inverting amplifier?	Remember	CO5	
13.	Define Gain.	Remember	CO5	
14.	Draw the practical op-amp symbol.	Remember	CO5	
15.	What are the parameters of an op-amp?	Understand	CO5	
	PART-B (LONG ANSWER QUESTIONS)			
1.	Explain the following terms in an OP-AMP. I) input Bias current ii) Input offset voltage and current iii) slew rate.	Understand	CO5	
2.	Explain the operation of non-inverting Op-amp and derive the expression for output voltage?	Understand	CO5	
3.	With a neat diagram explain about square wave generator and derive the frequencyof Oscillation.	Understand	CO5	
4.	With a neat diagram explain about triangular wave generator and derive the frequency of Oscillation.	Remember	CO5	
5.	Drawand explain the operation of an op-amp as an integrator for square wave input.	Remember	CO5	
6.	Drawand explain the operation of an op-amp as differentiator for sine wave input.	Remember	CO5	
7.	Explain the operation of inverting Op-amp and derive the expression for output voltage?	Understand	CO5	
8.	With a neat diagram explain about free running oscillator and derive the frequency of Oscillation.	Understand	CO5	
9.	Draw and explain the operation of an op-amp as an integrator forsine wave input.	Remember	CO5	
10.	Drawand explain the operation of an op-amp as differentiator forsquare wave input.	Remember	CO5	
	PART-C (ANALYTICAL QUESTIONS)			
1	Design and draw the wave forms of 1KHZ square waveform generator using555 Timer for dutycycle i)D=25% ii) D=50%.	Remember	CO5	
2	Explain about the term CMRR, Input offset voltage, input offsetcurrent, input bias current, out offset voltage with reference to OPAMPs.	Remember	CO5	
3	Design an op-amp differentiator that will differentiate an Inputsignal with fmax = 100Hz	Remember	CO5	
4	Explain the operation of non-inverting Op-amp and derive the expression for voltage gain?	Understand	CO5	
5	Explain the operation of non-inverting Op-amp and derive the expression for output voltage?	Understand	CO5	
6	Explain the operation of inverting Op-amp and derive the expression for output voltage?	Understand	CO5	