COURSE CODE: 23EC0408 **R23**

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR

(AUTONOMOUS)

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QUESTION BANK (DESCRIPTIVE)

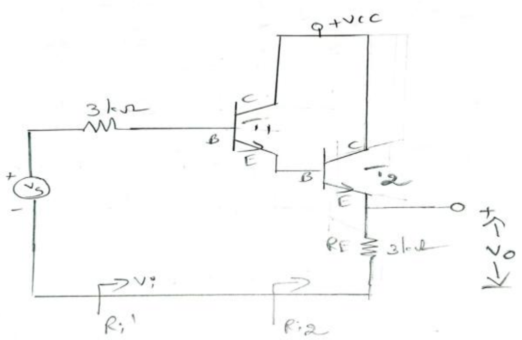
Subject with Code: Electronic Circuits Analysis(23EC0408)

Course & Branch: B.Tech.–ECE

Regulation: R23 **Year & Sem:** II-B.Tech.& II-Sem.

UNIT –I

Multistage and Differential Amplifiers

1	a)	What is the need for multistage amplifiers?	[L1] [CO1]	[2M]
	b)	Draw the h-parameter model of a transistor.	[L1] [CO1]	[2M]
	c)	A three-stage amplifier has gain of 10 dB, 20 dB and 30 dB respectively. Calculate overall gain of the amplifier.	[L3] [CO2]	[2M]
	d)	Define bandwidth of an amplifier and give its unit.	[L1] [CO1]	[2M]
	e)	What is a Differential amplifier?	[L2] [CO2]	[2M]
2	a)	Define distortion. Explain the cause and effects of amplitude, frequency and phase distortion in an amplifier.	[L2] [CO1]	[5M]
	b)	Classify the amplifiers.	[L2] [CO1]	[5M]
3	a)	Discuss various coupling schemes used in multistage amplifiers.	[L2] [CO2]	[5M]
	b)	Explain the operation of RC coupled amplifier with a neat circuit diagram and give the expressions for A_V, A_I, R_I, and R_O.	[L2] [CO1]	[5M]
4	a)	Derive the expressions for overall A_V, A_I, R_I, and R_O for a two stage RC coupled CE-CE amplifier.	[L3] [CO2]	[6M]
	b)	Sketch the frequency response curve of an RC coupled amplifier and define 3dB frequencies.	[L1] [CO1]	[4M]
5	a)	Construct the circuit diagram of Cascode amplifier and derive the expressions for overall A_V, A_I, R_I, and R_O.	[L3] [CO2]	[6M]
	b)	List the applications of Cascode amplifier and Darlington pair.	[L1] [CO1]	[4M]
6	a)	Construct the circuit diagram of a Darlington amplifier and derive the expressions for overall A_V, A_I, R_I, and R_O.	[L3] [CO1]	[5M]
	b)	For the circuit shown calculate overall R_i, A_i, A_o, R_o. Given h_{ie} = 1.1 kΩ, h_{fe} = 50, $h_{re} = 2.5 \times 10^{-4}$, h_{oe} = 25 μA/V. 	[L3] [CO2]	[5M]

7	a)	Analyse the MOS differential amplifier with a neat circuit diagram for common mode input voltage.	[L4] [CO2]	[5M]
	b)	Analyse the MOS differential amplifier with a neat circuit diagram for differential input voltages.	[L4] [CO2]	[5M]
8		With suitable circuit diagrams, derive the expression for differential voltage gain of a MOS differential amplifier using small signal operation.	[L3] [CO2]	[10M]
9	a)	Construct the basic structure of MOS and BJT differential amplifiers.	[L2] [CO1]	[5M]
	b)	Analyze BJT differential amplifier with a neat circuit diagram for common mode operation.	[L3] [CO2]	[5M]
10	a)	List the non-ideal characteristics of a differential amplifier.	[L1] [CO1]	[6M]
	b)	Explain in detail about input offset voltage and input offset current of a BJT differential pair.	[L2] [CO1]	[4M]
11	a)	List the factors that contribute to the input offset voltage of both MOS and BJT differential pair.	[L1] [CO1]	[6M]
	b)	Explain in detail about input offset voltage of a MOS differential pair and input common mode range.	[L2] [CO1]	[4M]

UNIT –II

Frequency Response

1.	a)	Define gain of an amplifier and express it in dB.	[L1] [CO1]	[2M]
	b)	List the internal capacitances of MOS differential amplifier.	[L1] [CO1]	[2M]
	c)	List the internal capacitances of BJT differential amplifier.	[L1] [CO1]	[2M]
	d)	Define f_T and f_β and give their relation.	[L1] [CO1]	[2M]
	e)	What is gain bandwidth product?	[L1] [CO1]	[2M]
2.	a)	Draw the circuit diagram of a Common emitter amplifier and explain the low frequency response.	[L3] [CO2]	[5M]
	b)	Draw the circuit diagram of a Common source amplifier and explain the low frequency response.	[L3] [CO2]	[5M]
3.	a)	Draw the high frequency model of MOSFET.	[L2] [CO2]	[4M]
	b)	With relevant circuit diagrams, explain the internal capacitive effects of MOSFET.	[L2] [CO2]	[6M]
4.		Find the mid band gain A_M and upper 3dB frequency f_H of a CS amplifier fed with a signal source having an internal resistance, R_{sig}= 100KΩ. The amplifier has R_G = 3.7 MΩ, R_D = R_L = 15 kΩ, and g_m = 1 mA/V and r_0=150KΩ, C_{gs}=1pF and C_{gd}=0.3pF.	[L4] [CO6]	[10M]
5.	a)	Draw the high frequency model of BJT.	[L2] [CO2]	[4M]
	b)	With relevant diagrams, explain the internal capacitive effects of BJT.	[L2] [CO2]	[6M]
6.		Derive the expressions for gain and upper 3dB frequency of a MOSFET CS amplifier operating at high frequency and draw the high frequency response.	[L3] [CO2]	[10M]
7.	a)	Derive the expressions for gain and upper 3dB frequency of CE amplifier at high frequency and draw the high frequency response.	[L3] [CO2]	[5M]
	b)	Short circuit CE current gain of a transistor is 20 at a frequency of 1MHz. If f_β = 200KHz, Calculate (i) f_T (ii) h_{fe} (iii) Find $\|A_i\|$ at frequency of 10MHz	[L3] [CO5]	[5M]
8.	a)	Derive the expression for f_T of a MOSFET C S amplifier operating at high frequency.	[L4] [CO2]	[5M]
	b)	Derive the relation between f_T and f_β for a BJT CE amplifier operating at high frequency.	[L4] [CO2]	[5M]
9.	a)	Determine the unity gain bandwidth of an FET, given g_m=1.2mA/v, C_{gd}=10pF and C_{gs}=50pF.	[L3] [CO2]	[4M]
	b)	A high frequency amplifier uses a transistor which is driven from a source with R_s=0Ω. Calculate the value of f_H, if R_L=0Ω. Assume typical values of hybrid –pi parameters.	[L4] [CO2]	[6M]
10.		Explain about Emitter follower (CC) with a neat circuit diagram operating at high frequencies and derive the necessary expressions.	[L2] [CO2]	[10M]
11.		Explain about Source follower (CD) with a neat circuit diagram operating at high frequencies and derive the necessary expressions.	[L2] [CO2]	[10M]

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UNIT –III

Feedback Amplifiers & Oscillators

1.	a)	What is meant by feedback? Classify the types of feedback.	[L1] [CO1]	[2M]
	b)	List the four basic feedback topologies.	[L2] [CO1]	[2M]
	c)	List the properties of negative feedback amplifiers.	[L1] [CO1]	[2M]
	d)	Define oscillator and list the types of oscillators.	[L1] [CO1]	[2M]
	e)	Explain Barkhausen criterion.	[L2] [CO1]	[2M]
2.	a)	Draw the general structure of feedback amplifier and derive the expression for gain of a feedback amplifier.	[L1] [CO3]	[7M]
	b)	A feedback amplifier has a gain of 1000 without feedback. If 10% of the output voltage is fed back to the input in a negative feedback configuration. Calculate the gain of the amplifier with feedback.	[L4] [CO3]	[3M]
3.	a)	Discuss the Gain De-sensitivity and Bandwidth extension properties in feedback amplifiers.	[L1] [CO3]	[5M]
	b)	Illustrate the reduction in non-linear distortion and noise after application of negative feedback in feedback amplifiers.	[L2] [CO3]	[5M]
4.	a)	Explain the four feedback amplifier topologies in detail with neat block diagrams.	[L2] [CO3]	[8M]
	b)	Explain types of samplers and mixers used in negative feedback amplifiers.	[L2] [CO3]	[2M]
5.	a)	Draw the structure and equivalent circuit of series - shunt feedback amplifier and derive the expressions for A_f, R_{if}, and R_{of}.	[L3] [CO3]	[5M]
	b)	Draw the structure and equivalent circuit of feedback series – series amplifier and derive the equations for A_f, R_{if}, and R_{of}.	[L3] [CO3]	[5M]
6.	a)	Draw the structure and equivalent circuit of feedback shunt – series amplifier feedback and derive the equations for A_f, R_{if} and R_{of}.	[L3] [CO3]	[6M]
	b)	Draw the structure and equivalent circuit of feedback shunt-shunt and derive the equations for A_f, R_{if}, and R_{of}.	[L3] [CO3]	[4M]
7.	a)	Explain the working principle of an oscillator with suitable block diagram.	[L2] [CO1]	[4M]
	b)	Construct an RC phase shift oscillator using BJT and derive the expressions for frequency of oscillations and condition for sustained oscillations.	[L3] [CO4]	[6M]
8.	a)	Determine the frequency of oscillations when a RC phase shift oscillator has R=10kΩ, C=0.01μF and R_C = 2.2 KΩ. Also find the minimum current gain needed for this purpose.	[L3] [CO4]	[3M]
	b)	Explain the working principle of Wein-bridge oscillator using BJT and deduce the expression for frequency of oscillations and condition for sustained oscillations.	[L4] [CO4]	[7M]
9.	a)	In a Wein-bridge oscillator, if the value of R is 100 KΩ, and frequency of oscillation is 10 KHz, Calculate the value of capacitor C.	[L4] [CO4]	[4M]
	b)	Derive the general condition for LC oscillators and give its block diagram.	[L3] [CO4]	[6M]
10.	a)	Establish the condition for sustained oscillations & frequency of oscillations for Colpitts oscillator.	[L3] [CO4]	[5M]
	b)	Determine the frequency of oscillations & condition for sustained oscillations for Hartley oscillator.	[L4] [CO4]	[5M]
11.	a)	In Colpitts oscillator, C_1 = 0.2μF and C_2 = 0.02 μF. If the frequency of oscillation is 10kHz, Calculate the value of inductor.	[L4] [CO4]	[5M]
	b)	Discuss about the Crystal Oscillator with neat diagrams.	[L2] [CO4]	[5M]

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UNIT –IV
Power Amplifiers

1.	a)	Define Power amplifier. List the different types of power amplifiers.	[L1] [CO3]	[2M]
	b)	Give the expression for total harmonic distortion (THD) in an amplifier.	[L1] [CO3]	[2M]
	c)	Define crossover distortion.	[L1] [CO3]	[2M]
	d)	List the key characteristics of power BJTs.	[L1] [CO3]	[2M]
	e)	What are the advantages of power MOSFETs over power BJTs?	[L1] [CO3]	[2M]
2.	a)	Classify the Large Signal Power Amplifiers based on biasing condition.	[L2] [CO3]	[5M]
	b)	Sketch the collector current waveforms for class A, class B, class AB and class C amplifiers.	[L3] [CO3]	[5M]
3.	a)	With neat diagrams, explain Series fed directly coupled Class A Power amplifier.	[L2] [CO3]	[4M]
	b)	Derive the maximum efficiency expression for Series fed directly coupled Class A Power Amplifier.	[L3] [CO3]	[6M]
4.	a)	Discuss about Transformer coupled Class A Power Amplifier with diagram and determine its maximum efficiency.	[L2] [CO3]	[5M]
	b)	The loudspeaker of 8 Ω is connected to the secondary of the output transformer of a class A Amplifier. The quiescent collector current is 140 mA. The turns ratio of transformer is 3:1. The collector supply voltage is 10 V. If ac power delivered to the loudspeaker is 0.48 W, assuming ideal transformer, determine (i) AC power developed across primary, (ii) RMS value of load voltage, (iii) RMS value of primary voltage, (iv) RMS value of load current.	[L3] [CO3]	[5M]
5.	a)	Explain the working principle of Class B Push Pull Power amplifier with neat diagram.	[L2] [CO3]	[4M]
	b)	Derive the expression for efficiency of Class B Push Pull Power Amplifier with neat diagram and determine its maximum efficiency.	[L3] [CO3]	[6M]
6.	a)	Discuss about Complementary Symmetry Class B Push Pull Power Amplifier with neat diagrams.	[L2] [CO3]	[6M]
	b)	List the advantages of complementary symmetry over push-pull Class B Power Amplifier.	[L1] [CO3]	[4M]
7.	a)	Define Distortion and derive the expression for Total Harmonic Distortion.	[L3] [CO3]	[5M]
	b)	Construct the circuit diagram of Class C Power amplifier and determine its maximum efficiency.	[L3] [CO3]	[5M]
8.	a)	Construct the circuit diagram of Class AB push pull amplifier.	[L3] [CO3]	[5M]
	b)	Compare push-pull Class B and Complementary symmetry Class B power amplifiers.	[L3] [CO3]	[5M]
9.	a)	Explain crossover distortion and how it can be eliminated.	[L2] [CO3]	[4M]
	b)	Compare class A, class B, Class AB and Class C power amplifiers.	[L2] [CO3]	[6M]
10.		Discuss about the following properties of power transistors. i)Junction Temperature ii)Thermal resistance iii)Power dissipation vs temperature iv)Transistor case and heat sink	[L2] [CO3]	[10M]
11.	a)	Describe the structure of Power MOSFET.	[L2] [CO3]	[5M]
	b)	Explain the V-I Characteristics of Power MOSFETs.	[L2] [CO3]	[5M]

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UNIT-V
Tuned Amplifiers & Multivibrators

1.	a)	Define tuned amplifier and list the applications of tuned amplifiers.	[L1] [CO2]	[2M]
	b)	A tuned amplifier has a resonant frequency of 1 MHz and bandwidth of 10 kHz. Calculate the Quality Factor (Q) of the amplifier.	[L4] [CO2]	[2M]
	c)	Differentiate between single-tuned and double-tuned amplifiers.	[L2] [CO3]	[2M]
	d)	Define Multivibrator and mention its applications.	[L1] [CO2]	[2M]
	e)	Differentiate between astable and Monostable multivibrators.	[L2] [CO2]	[2M]
2.	a)	Explain the operation of a single tuned capacitive coupled amplifier with a neat circuit diagram.	[L2] [CO2]	[4M]
	b)	Deduce the expressions for Quality factor, voltage gain and bandwidth of a single tuned capacitive coupled amplifier with necessary circuit diagrams.	[L4] [CO2]	[6M]
3.	a)	A single tuned RF amplifier uses a transistor with an output resistance of 50 KΩ, output capacitance of 15 pF and internal resistance of next stage is 20 kΩ. The tuned circuit consists of 47 pF capacitance in parallel with series combination of 1μH inductance and 2Ω resistance. Determine resonant frequency, effective quality factor and bandwidth of the circuit.	[L3] [CO3]	[5M]
	b)	Compare different types of tuned amplifiers.	[L2] [CO1]	[5M]
4.		Discuss working of double Tuned Amplifier with neat diagram and derive the expression for its bandwidth.	[L3] [CO2]	[10M]
5.	a)	Sketch the frequency response of double Tuned amplifier and Stagger tuned amplifier and explain them in detail.	[L3] [CO1]	[6M]
	b)	With circuit diagram, describe the stagger tuning operation and derive the expression for relative gain. Also sketch the necessary waveforms.	[L3] [CO1]	[4M]
6.	a)	What are the types of multivibrators? List their applications.	[L1] [CO1]	[3M]
	b)	Explain briefly about the operation of a Bistable multivibrator with a neat circuit diagram and draw the input and output waveforms.	[L2] [CO3]	[7M]
7.	a)	Explain about the triggering methods of a Bistable multivibrator.	[L2] [CO3]	[4M]
	b)	What is a Monostable multivibrator? Explain its working with the help of a neat circuit diagram and waveforms.	[L2] [CO3]	[6M]
8		Derive the expression for pulse width (T) of a collector coupled Monostable multivibrator.	[L3] [CO4]	[10M]
9.		With a neat circuit diagram, explain the working of a collector Coupled astable multivibrator and draw the input and output waveforms.	[L2] [CO3]	[10M]
10.		Derive the expression for the Time period (T) of the Astable multivibrator.	[L3] [CO4]	[10M]
11.	a)	Explain the operation of Schmitt trigger.	[L2] [CO3]	[5M]
	b)	Determine the value of capacitors to be used in an Astable multivibrator to provide a train pulse 2μs wide at a repetition rate of 100 KHz, if $R_1 = R_2 = 20k\Omega$.	[L3] [CO5]	[5M]