U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February 2025 Semester End Main Examinations

Programme: B.E.
Branch: Electrical and Electronics Engineering
Course Code: 23EE4PCAEL
Course: Analog Electronics and Linear Integrated Circuits

Semester: IV
Duration: 3 hrs.
Max Marks: 100

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	*CO*	*PO*	Marks
1	a)	With a neat circuit and relevant equations, analyze a Fixed Bias circuit, for a BJT in common emitter configuration.	*CO3*	*PO1*	**07**
	b)	Determine the levels of R_C, R_E, R_1, R_2 for the network shown in Fig. 1 for the operating point indicated.	*CO4*	*PO2*	**07**

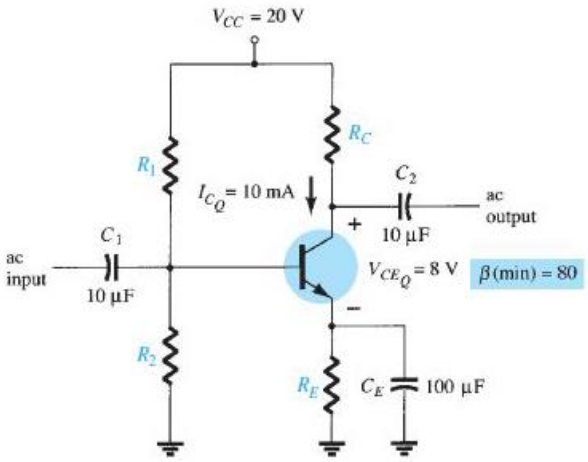
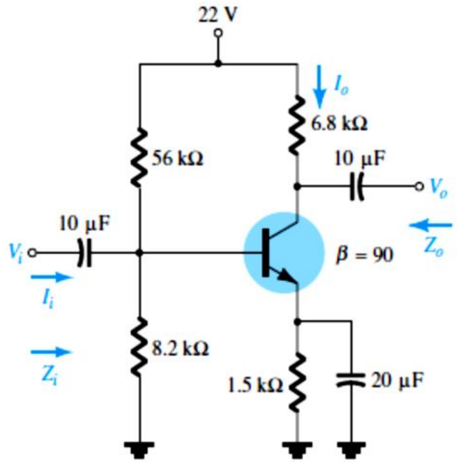
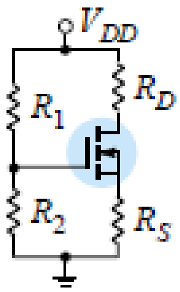
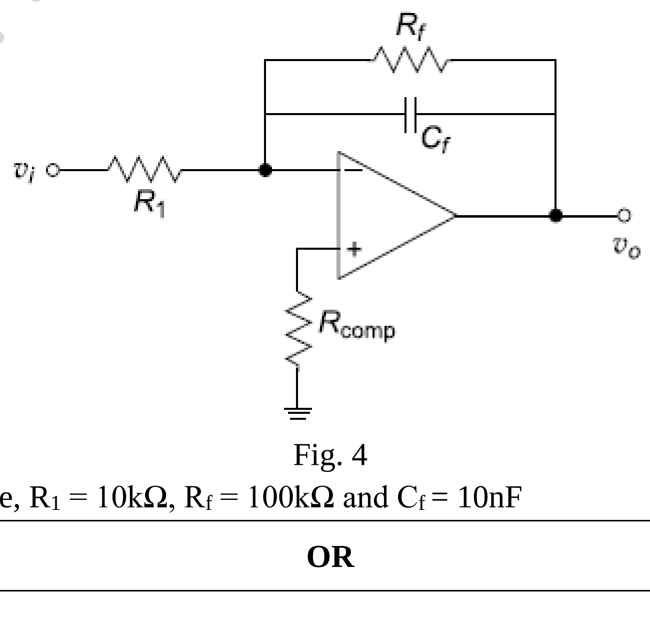
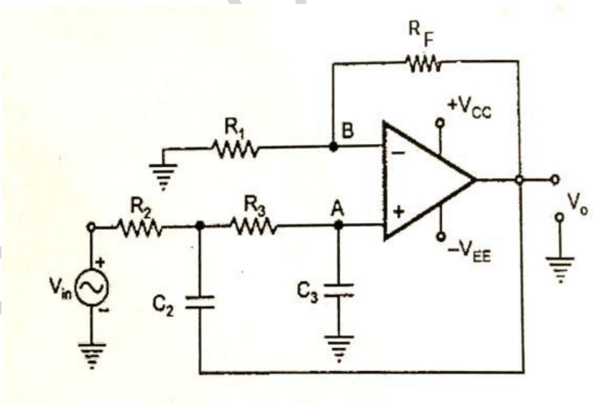


Fig. 1

	c)	Analyze a Common Emitter Fixed Bias configuration with relevant equations of gains and impedances. Also, draw the r_e equivalent model for the same.	*CO3*	*PO1*	**06**
		OR			
2	a)	Given β= 90 for the circuit shown in Fig. 2, determine i) r_e ii) Z_i iii) Z_o ($r_0 = \infty\ \Omega$) iv) A_v ($r_0 = \infty\ \Omega$) v) the parameters if r_o= 50kΩ and compare the results.	*CO2*	*PO2*	**07**

		 Fig. 2			
	b)	Analyze a voltage divider bias configuration with relevant equations of gains and impedances. Also, draw the r_e equivalent model for the same.	CO3	PO2	**07**
	c)	Explain the operation and characteristics of a Bipolar Junction transistor with relevant diagrams.	CO1	PO1	**06**
		UNIT - II			
3	a)	Explain the essential operation and constructional features of a n-channel Depletion type MOSFET. Also, sketch the transfer characteristics for an *n*-channel depletion-type MOSFET with I_{DSS} = 10 mA and V_P = 4 V.	CO1	PO2	**12**
	b)	For the E – MOSFET in the voltage divider configuration shown in Fig. 3, given, R_D = 2.4kΩ, R_S = 1.5kΩ, R_1 = 2.1MΩ, R_2 = 270kΩ, V_{DD} = 16V, I_{DSS} = 8mA, V_{GS} = -2V.  Fig. 3 Determine the Q - operating point, V_D, V_S. (Use graph sheet for accurate reading).	CO2	PO2	**08**
		OR			
4	a)	List the advantages and disadvantages of MOSFET	CO2	PO2	**05**
	b)	Explain the operation of n-channel enhancement type MOSFET	CO2	PO2	**08**
	c)	Explain the voltage divider bias configuration of E MOSFET	CO2	PO2	**07**

			UNIT - III			
	5	a)	Substitute the complete hybrid equivalent circuit into a two-port system and derive current and voltage gain expressions. (Generic expressions).	*CO3*	*PO2*	**07**
		b)	Draw the AC equivalent circuit using an approximate hybrid equivalent model for the BJT voltage divider bias configuration. Write the expressions for input impedance, output impedance, voltage gain, and current gain.	*CO1*	*PO2*	**06**
		c)	With a neat circuit diagram and waveforms, explain how the Complementary Symmetry Class B power amplifier works. Calculate the maximum efficiency of a Class B amplifier.	*CO2*	*PO1*	**07**
			OR			
	6	a)	Derive the expressions for input impedance, output impedance and voltage gain of a common emitter fixed bias configuration in re model. For the network with R_B =470kΩ, R_c =3kΩ, Vcc =12V, β=100 and ro=50kΩ, find the values of Zi, Zo and Av.	*CO2*	*PO1*	**10**
		b)	Explain the operating principle of transformer coupled class A amplifier. Draw the characteristics with load lines. Obtain the expressions for output power, efficiency and maximum efficiency.	*CO2*	*PO1*	**10**
			UNIT - IV			
	7	a)	With a neat circuit diagram and relevant equations, briefly explain the operation of: (i) Differential amplifier and (ii) Three input Inverting summing amplifier.	*CO1*	*PO1*	**08**
		b)	Define and explain the following terminologies: (i) Input offset voltage, (ii) Input bias current, (iii) Slew Rate, (iv) Gain Bandwidth product	*CO1*	*PO1*	**08**
		c)	For a practical integrator circuit shown in Fig. 4, analyze and determine the lower frequency limit of integration and the output response for a sine wave input of 1V peak at 2.5kHz.  Fig. 4 Assume, R_1 = 10kΩ, R_f = 100kΩ and C_f = 10nF	*CO3*	*PO2*	**04**
			OR			

	8	a)	With a neat circuit diagram and relevant equations, briefly explain the operation of: (i) Summing amplifier and (ii) Scaling amplifiers.	*CO1*	*PO1*	**08**
		b)	Define and explain the following terminologies: (i) Input offset current, (ii) Common Mode Rejection Ratio, (iii) Input Resistance (iv) Output Resistance	*CO1*	*PO1*	**08**
		c)	Design a differentiator to differentiate an input signal that varies in frequency from 10Hz to about 1kHz. Draw the complete circuit with component values.	*CO4*	*PO2*	**04**
			UNIT - V			
	9	a)	Using a 741 op-amp with a saturation voltage (±Vsat) of ±14V, design an inverting Schmitt Trigger circuit with a V_{UTP} = +6V and V_{LTP} = +3V. Explain how it works, sketch the input, output waveforms, and hysteresis curve.	*CO4*	*PO2*	**07**
		b)	With a neat circuit diagram and waveforms, explain the operation of a Triangular Wave Generator circuit. Derive an expression for the frequency of the output triangular waveform.	*CO2*	*PO2*	**07**
		c)	For the circuit shown in the Fig. 5, R_2 = 20 kΩ, R_3 = 10 kΩ, C_2 = 0.1 μF, C_3 = 0.01 μF, R_1 = 25 kΩ and R_F = 16 kΩ. Find the cut-off frequency and passband gain. Plot its magnitude response.  Fig. 5	*CO3*	*PO2*	**06**
			OR			
	10	a)	With a relevant circuit explain the operation of triangular wave.	*CO3*	*PO2*	**08**
		b)	Design RC phase shift oscillator circuit to generate sustained oscillations of frequency of 1kHz	*CO3*	*PO2*	**06**
		c)	What are filters? How are they classified	*CO3*	*PO2*	**06**

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