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

Autonomous Institute Affiliated to VTU

October 2024 Supplementary Examinations

Programme: B.E.   **Semester: IV**
Branch: Electrical and Electronics Engineering   **Duration: 3 hrs.**
Course Code: 23EE4PCAEL   **Max Marks: 100**
Course: Analog Electronics and Linear Integrated Circuits
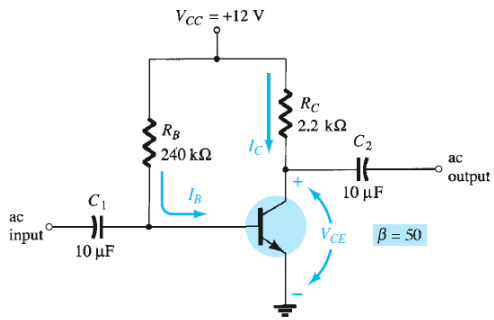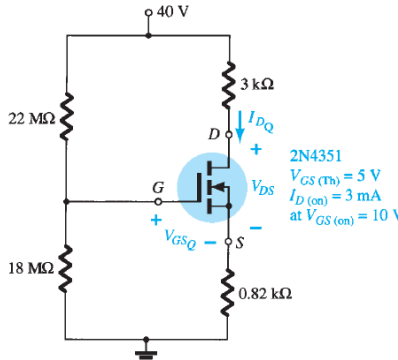
Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
                 2. Missing data, if any, may be suitably assumed.

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)		Describe the working of npn transistor in Common Emitter configuration. Draw the input and output characteristics. Mark all the regions of operation and load line.	CO1	PO1	**10**
	b)		**i)** Given $\beta=120$, re=4.5Ω, ro=40kΩ, sketch approximate hybrid equivalent model. **ii)** Given $h_{ie}=1k$, $h_{re}=2 \times 10^{-4}$, $h_{fe}=90$, $h_{oe}=20$ μS. Sketch the re model.	CO2	PO1	**10**
			OR			
2	a)		What is bias stabilization? What are the factors affecting the stability of a transistor? Define stability factors and give expressions for stability factors for voltage divider bias.	CO1	PO1	**06**
	b)		What is the importance of constant current sources in an integrated circuit? i. Construct a constant current source circuit with a npn transistor. ii. Draw a modified circuit in which the output current is independent of the supply voltage.	CO2	PO1	**08**
	c)		Determine the following for the fixed-bias configuration of Fig. 2c. a. I_{BQ} and I_{CQ}. b. V_{CEQ}. c. V_B and V_C. d. V_{BC}. Fig. 2c.	CO2	PO3	**06**
			UNIT - II			
3	a)		With a neat circuit diagram, illustrate the operation of an n-channel enhancement type MOSFET. Draw its output and transfer characteristics.	CO3	PO2	**08**

	b)	Determine I_{DQ}, V_{GSQ}, and V_{DS} for the network of Figure 3b	CO2	PO1	**08**

Figure 3b

	c)	Draw the small signal model of enhancement type MOSFET. Derive the expression for the transconductance gm.	CO2	PO3	**04**

UNIT - III

4	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, V_{cc}=12V, β=100 and ro=50kΩ, find the values of Zi, Zo and Av.	CO1	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

5	a)	List any eight characteristics of an ideal op-amp	CO2	PO1	**06**

	b)	Define the following terms with reference to an op-amp
		   i. Input offset voltage
		   ii. Input bias current
		   iii. Power supply rejection ratio
			CO2	PO1	**06**

	c)	Design an op-amp differentiator that will differentiate an input signal with f_{max}=100Hz. Draw the output waveform for a square wave input of 1V peak at 100Hz applied to the differentiator. Assume C1=0.1μF.	CO2	PO4	**08**

OR

6	a)	Draw the frequency response of an op-amp by deriving the expression of open-loop voltage gain as a function of frequency	CO3	PO2	**08**
	b)	Design and draw an op-amp adder circuit to get the output expression as V_o= - (5V_1+0.5V_2+3.5V_3). Assume the feedback resistor to be 1kΩ.	CO2	PO3	**06**
	c)	What is CMRR in an op-amp? What is the significance of CMRR. What is the typical value of CMRR of uA741 op-amp.	CO2	PO2	**06**

UNIT - V

7	a)	With neat circuit diagram and waveforms, explain the operation of a second order low pass filter. Draw the frequency response. Derive an expression for the transfer function of the filter.	CO2	PO1	**10**
	b)	With neat circuit diagram and waveforms, explain the operation of an Astable Multivibrator circuit. Derive an expression for the total time period of the output waveform.	CO4	PO2	**10**

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