U.S.N.										

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

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E. **Semester: IV**

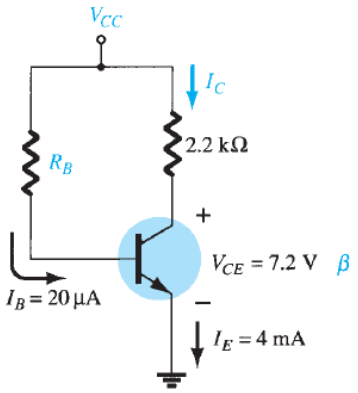
Branch: Electrical and Electronics Engineering **Duration: 3 hrs.**

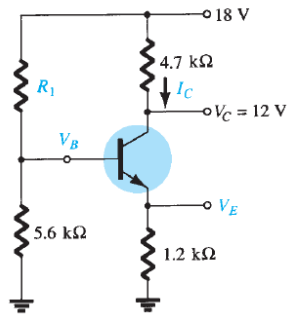
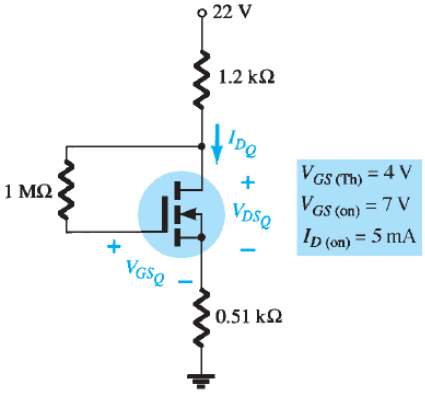
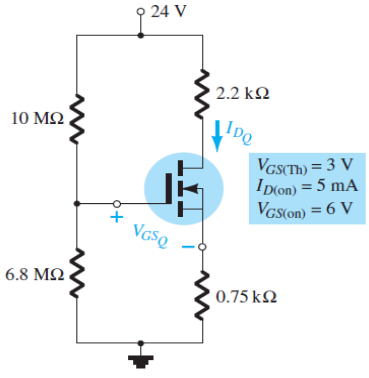
Course Code: 23EE4PCAEL **Max Marks: 100**

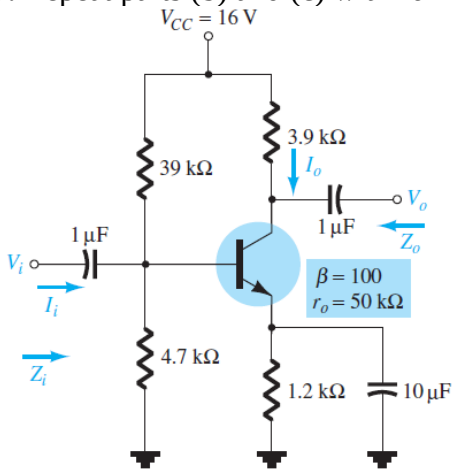
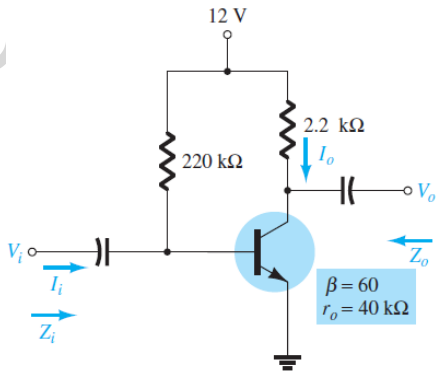
Course: Analog Electronics and Linear Integrated Circuits

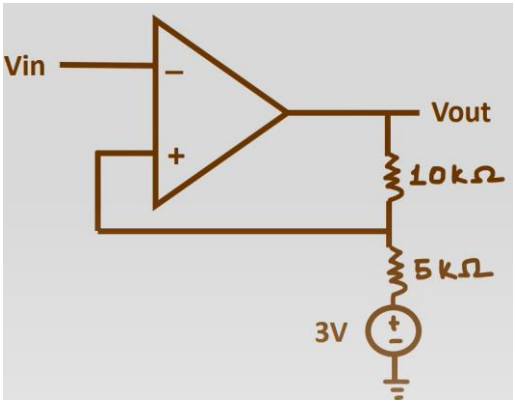
Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

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)		What the major difference between a bipolar and a unipolar device? Why is BJT known as a bipolar device? How must the two transistor junctions be biased for proper transistor amplifier operation for a common base configuration.	CO2	PO1	**06**
	b)		Determine the following for the fixed-bias configuration of Fig. 1b. a. I_C. b. V_{CC}. c. β d. R_B.  Fig 1b	CO3	PO2	**08**
	c)		Given $I_{E(dc)}$ = 1.2 mA, β=120, and r_o=40 kΩ, sketch the following: **a.** Common-emitter hybrid equivalent model. **b.** Common-emitter r_e equivalent model.	CO3	PO2	**06**
			OR			
2	a)		Describe the operation of an n-channel BJT in Common-Emitter configuration. Draw the input and output characteristics.	CO2	PO1	**06**
	b)		For the voltage-divider bias configuration of Fig. 2b, determine: a. I_Q d. V_B e. V_E f. R_1	CO3	PO2	**08**

			 Fig 2b			
	c)	Given h_{ie} = 2.4 kΩ, h_{fe} = 100, h_{re} = 4 ×10^{-4}, and h_{oe} = 25 mS, sketch the following: **a.** Common-emitter hybrid equivalent model. **b.** Common-emitter *re* equivalent model.	*CO3*	*PO2*	**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.	*CO1*	*PO1*	**10**
	b)	For the network of Fig. 3 b , determine: **a.** I_{DQ}. **b.** V_{GSQ} and V_{DSQ}. **c.** V_D and V_S . **d.** V_{DS} .  Fig 3.b	*CO3*	*PO2*	**10**
		OR			
4	a)	With a neat circuit diagram, illustrate the operation of an n-channel depletion type MOSFET. Draw its output and transfer characteristics.	*CO1*	*PO1*	**10**
	b)	For the voltage-divider configuration of Fig. 4b, determine: **a.** I_{DQ} and V_{GSQ}. **b.** V_D and V_S .  Fig 4b	*CO3*	*PO2*	**10**

			UNIT - III			
	5	a)	For the network of Fig. 5a : **a.** Determine *re* . **b.** Calculate *Zi* and *Zo* . **c.** Find *Av* . **d.** Repeat parts (b) and (c) with *ro* = 25kΩ.  Fig 5 a	*CO3*	*PO2*	**12**
		b)	Explain the operating principle of series fed class A amplifier. Obtain the expressions for output power, efficiency and maximum efficiency.	*CO2*	*PO2*	**08**
			OR			
	6	a)	For the network shown in fig 6a: **a.** Determine *re* . **b.** Find h_{fe} and h_{ie} **c.** Find *Zi* and *Zo* using the hybrid parameters. **d.** Calculate *Av* and *Ai* using the hybrid parameters. **e.** Determine *Zi* and *Zo* if h_{oe} = 50 mS. **f.** Determine *Av* and *Ai* if h_{oe} = 50 mS.  Fig 6 a	*CO3*	*PO2*	**12**
		b)	Explain the operating principle of class B push pull amplifier. Obtain the expressions for output power, efficiency and maximum efficiency.	*CO2*	*PO2*	**08**
			UNIT - IV			
	7	a)	Define the following terms with reference to an op-amp	*CO1*	*PO1*	**06**

			i. Input offset voltage ii. Input bias current iii. Power supply rejection ratio			
		b)	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.	*CO4*	*PO3*	**08**
		c)	With neat circuit diagrams, describe the working of inverting and non-inverting op-amp configurations. Derive the expression of output voltage in both the cases. Plot the waveforms for a sinusoidal input	*CO2*	*PO2*	**06**
			OR			
	8	a)	List any six characteristics of an ideal op-amp	*CO1*	*PO1*	**06**
		b)	Design and draw an op-amp adder circuit to get the output expression as V_o=-(3.5V_1+2.5V_2+0.5V_3). Assume the feedback resistor to be 1kΩ.	*CO4*	*PO4*	**08**
		c)	With neat circuit diagram and waveforms, explain the operation of an op-amp integrator.	*CO2*	*PO2*	**06**
			UNIT - V			
	9	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.	*CO3*	*PO2*	**10**
		b)	With relevant circuit diagram and waveforms describe the operation of a triangular wave generator. Derive the expression for frequency of operation.	*CO3*	*PO2*	**10**
			OR			
	10	a)	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.	*CO3*	*PO2*	**10**
		b)	For the Schmitt trigger shown in fig 10. b with a saturation voltage of ±15V, find Upper and lower threshold voltages. Plot the hysteresis curve  Fig 10 b	*CO3*	*PO2*	**10**

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