U.S.N.										

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

Autonomous Institute Affiliated to VTU

April 2025 Semester End Make-Up Examinations

Programme: B.E. **Semester: III**

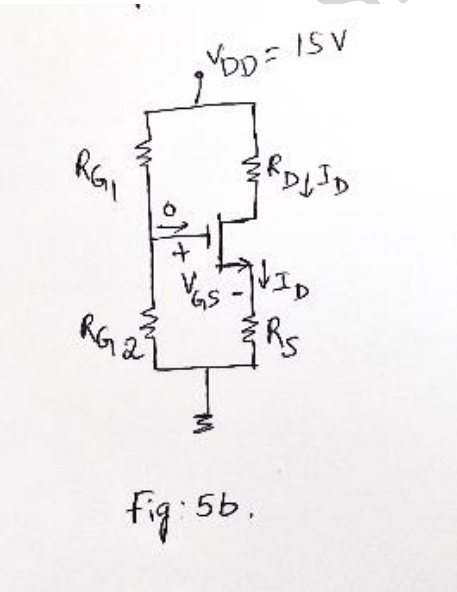
Branch: Electronics & Telecommunication Engineering **Duration: 3 hrs.**

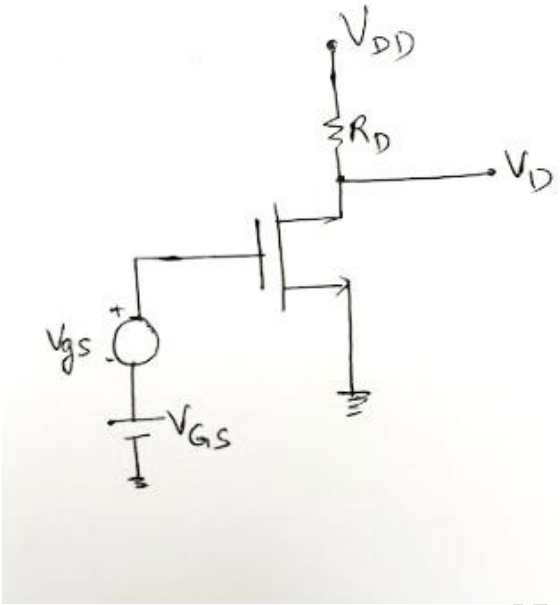
Course Code: 23ET3PCALC **Max Marks: 100**

Course: Analog and Linear Circuits

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

			UNIT - I	***CO***	***PO***	**Marks**
1	a)		Design a clipper circuit to clip the negative signal at 2 volts using Series Clipping circuit.	*CO1*		**04**
	b)		Explain the design constraints of classical discrete-circuit biasing arrangement with circuit and relevant equations and explain how R_E provides a negative feedback action to stabilize the bias current.	*CO1*		**08**
	c)		Design the Voltage Divider Bias network of the amplifier to establish a current $I_E = 1$ mA, using a power supply of $V_{CC} = +12$ v . The transistor is specified to have a nominal β value of 100.	*CO1*		**08**
			OR			
2	a)		Derive the expression for ic and gm using of Hybrid-π Model of the BJT (consider BJT as voltage controlled current source)	*CO1*		**04**
	b)		Explain with a neat circuits diagram the biasing using a Collector-to-Base Feedback Resistor. Derive the expressions for I_E and V_{CB}	*CO1*		**08**
	c)		Design the circuit of collector to base bias CE amplifier to obtain a dc emitter current of 1 mA, maximum gain, and a ± 2-V signal swing at the collector; that is, design for VCE = +2.3 V. Let VCC = 10 V and β = 100.	*CO1*		**08**
			UNIT - II			
3	a)		Derive the expression for gain with feedback using block diagram of general structure of the feedback amplifier.	*CO2*	*PO1*	**08**
	b)		Explain the following properties of Negative feedback: (a) Gain De-sensitivity (b) Bandwidth Extension (c) Decrease in Non-linear effect (d) Increase in SNR	*CO2*	*PO1*	**12**
			OR			

	4	a)	Derive the expression of power-conversion efficiency of Class A amplifier with help of a neat circuit diagram and explanation	*CO2*	*PO1*	**08**
		b)	Explain the working of Class B output stage amplifier with help of neat circuit diagram and transfer characteristics. It is required to design a class B output stage to deliver an average power of 20 W to an 8-Ω load. The power supply is to be selected such that V_{CC} is about *5 V* greater than the peak output voltage. This avoids transistor saturation and the associated nonlinear distortion and allows for including short-circuit protection circuitry. Determine the supply voltage required, the peak current drawn from each supply, the total supply power, and the power-conversion efficiency. Also determine the maximum power that each transistor must be able to dissipate safely.	*CO2*	*PO1*	**12**
			UNIT - III			
	5	a)	Explain the effects of Biasing by Fixing VGS in a MOSFET with i_D–v_{GS} characteristic	*CO3*	*PO1*	**08**
		b)	Design the circuit of Fig. 5b to establish a dc drain current I_D = 0.5 mA. The MOSFET is specified to have Vt = 1 V and (kn′ W ⁄ L) = 1 mA/V^2. For simplicity, neglect the channel-length modulation effect (i.e., assume λ = 0). Use a power-supply V_{DD} = 15 V.  Fig: 5b.	*CO3*	*PO2*	**08**
		c)	Derive the expression for the Signal Current in the Drain Terminal for small signal operation with the help of a neat Conceptual amplifier circuit diagram.	*CO3*	*PO1*	**04**
			OR			
	6	a)	Explain the Biasing by Fixing V_G and Connecting a Resistance in the Source for MOSFET with the help of neat circuit diagrams	*CO3*	*PO1*	**08**
		b)	Find the dc current I_D and DC voltage V_D, g_m, voltage gain for amplifier circuit shown in Fig. 6b. if v_{gs} =0.2 sinwt volts, find v_d	*CO3*	*PO2*	**08**

			assuming small-signal approximation holds. Let V_{DD} =5V, R_D= 10KΩ ,V_t=1V, ($kn' W/L$) = 20uA/V^2 , V_{GS}=2V assume λ= 0.  Fig. 6b			
		c)	Derive the expression for the Voltage Gain of a MOSFET amplifier. Draw the instantaneous waveforms for v_{GS} and v_{DS}	*CO3*	*PO2*	**04**
			UNIT - IV			
	7	a)	Derive the expression for the closed loop gain of the Inverting and Non-inverting amplifier	*CO4*	*PO1*	**10**
		b)	Explain in detail positive and negative wave precision rectifier	*CO4*	*PO1*	**10**
			OR			
	8	a)	Explain with a neat circuit diagram Instrumentation Amplifier	*CO4*	*PO1*	**10**
		b)	Explain the following with a neat circuit diagram a. Comparator b. Virtual ground	*CO4*	*PO1*	**10**
			UNIT - V			
	9	a)	Explain the ADC using Successive-approximation method with help neat circuit diagram.	*CO3*	*PO1*	**10**
		b)	Explain the DAC using R-2R ladder with help neat circuit diagram	*CO3*	*PO1*	**10**
			OR			
	10	a)	Explain the internal block diagram of 555 timer	*CO3*	*PO1*	**10**
		b)	Explain with neat circuit the operation of Mono stable Multivibrator	*CO3*	*PO1*	**10**

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