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**

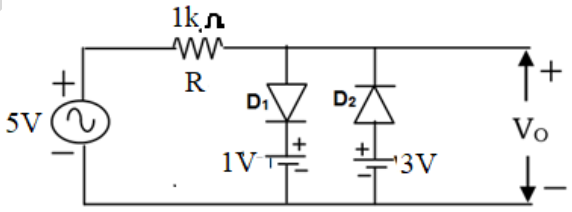
Branch: Electronics and Communication Engineering **Duration: 3 hrs.**

Course Code: 23EC3PCAEC **Max Marks: 100**

Course: Analog Electronic 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.

			CO	PO	Marks
		UNIT - I			
1	a)	Develop an expression for the quiescent current I_C and voltage V_{CE} for the voltage divider bias circuit.	CO2	PO 1	10
	b)	For the CE amplifier with $\beta = 80$, $I_E(dc) = 2$ mA and $r_o = 40k\Omega$, Determine the input impedance Z_i, the current gain and voltage gain if $R_L = 1.2$ kΩ.	CO2	PO 1	4
	c)	What are clampers? Describe the working of a positive clamper with relevant waveforms	CO 1	PO 1	6
		OR			
2	a)	Draw the r_e model and obtain the expression for input impedance, output impedance and voltage gain for CE voltage divider bias circuit	CO 2	PO 1	8
	b)	Calculate the operating point for the Voltage Divider Bias circuit given: $V_{CC} = 10$V, $R_1 = 10k\Omega$, $R_2 = 2.2$ kΩ, $R_C = 3.6$ kΩ, $R_E = 1$ kΩ.	CO 2	PO 1	6
	c)	Plot the transfer characteristics for the circuit shown in Figure 2(c), assuming the diodes D_1 and D_2 to be ideal, determine their conduction angles during positive and negative cycles.  Fig 2(c)	CO 2	PO 1	6
		UNIT - II			
3	a)	An amplifier rated at 40W output is connected to a 10 Ω speaker. (a) Calculate the input power required for full power output if the	CO 2	PO 1	4

			power gain is 25dB. (b) Calculate the input voltage for rated output if the amplifier voltage gain is 40dB.			
		b)	Determine the mid band gain, total gain and cut-off frequencies for CE amplifier with the following values. C_S = 10μF, C_E = 20 μF, C_C = 1 μF, R_S = 1kΩ, R_1 = 40 kΩ, R_2 = 10 kΩ, R_E = 2 kΩ, R_C = 4 kΩ, R_L = 2.2 kΩ, β = 100, r_o = ∞, and V_{CC} = 20V.	***CO 2***	***PO 1***	**6**
		c)	Explain Miller effect and derive the expressions for input and output capacitances using Miller's effect.	***CO 2***	***PO 1***	**10**
			OR			
	4	a)	Explain the different types of feedback used in amplifiers.	***CO 2***	***PO 1***	**8**
		b)	For an amplifier, the midband gain is 100 and lower cut-off frequency is I kHz. Calculate the gain of the amplifier at frequency of 20 Hz.	***CO 2***	***PO 1***	**2**
		c)	Obtain the expression for gain, input resistance and output resistance for a voltage series feedback amplifier.	***CO 2***	***PO 1***	**10**
			UNIT - III			
	5	a)	Explain the classification power amplifiers	***CO 1***		**5**
		b)	With a neat circuit diagram, explain the operation of series fed class A power amplifier and deduce its efficiency.	***CO 1***	***PO 1***	**10**
		c)	Calculate the harmonic distortion components for an output signal having fundamental amplitude of 2.5 V, second harmonic amplitude of 0.25 V, third harmonic amplitude of 0.1V, and fourth harmonic amplitude of 0.05V. Also determine the total harmonic distortion (THD).	***CO 2***	***PO 2***	**5**
			OR			
	6	a)	With a neat circuit diagram, explain the operation of complementary symmetry Class B push-pull amplifier and show that its maximum conversion efficiency is 78.5%.	***CO 1***	***PO 1***	**10**
		b)	For a class B amplifier providing a 22V peak signal to an 8 Ω load and a power supply of V_{CC} = 25 V, determine: (i) Input power (ii) Output power (iii) Circuit efficiency (iv) Power dissipated in output transistors.	***CO 2***	***PO 2***	**5**
		c)	What is distortion in power amplifiers? Define harmonic distortion.	***CO 1***		**5**
			UNIT - IV			
	7	a)	State the disadvantage of fixed V_{GS} biasing technique and explain how stability of operating point is achieved in drain to gate feedback resistor biasing technique in a MOSFET amplifier	***CO 1***	***PO 1***	**10**
		b)	It is required to design constant VG bias circuit using a voltage divider network to establish a dc drain current I_D = 0.5 mA. The MOSFET is specified to have Vt = 1 V, Kn1(W/L) =1mA/V^2 .	***CO 2***	***PO 2***	**10**

			Neglect the channel-length modulation effect. Use a power-supply V_{DD} = 15 V. Calculate the percentage change in the value of I_D obtained when the MOSFET is replaced with another unit having the same Kn' (W/L), but Vt = 1.5 V.			
			OR			
	8	a)	Describe in detail the construction of n- channel depletion type MOSFET.	***CO 1***	***PO 1***	**5**
		b)	An enhancement type NMOS transistor with V_t=0.7V conducts a current I_D=100µA when V_{GS}=V_{DS}=1.2V.Find the value of I_D for V_{GS}=1.5V and V_{DS}=3V. Also calculate the value of the drain to source resistance R_{DS} for small V_{DS} and V_{GS}=3.2V.	***CO 2***	***PO 2***	**10**
		c)	Compare and contrast the n-channel and p-channel enhancement type MOSFET characteristics.	***CO 1***	***PO 1***	**5**
			UNIT - V			
	9	a)	Draw the conceptual MOSFET amplifier circuit and derive the expression for (i) small signal drain current i_D (ii) Transconductance g_m and (iii) voltage gain A_v	***CO 1***	***PO1***	**12**
		b)	With a neat circuit diagram and ac equivalent circuit derive the expressions for R_{in}, A_{vo}, A_v and R_o for common source amplifier with an unbypassed source resistance.	***CO 2***	***PO 2***	**8**
			OR			
	10	a)	Analyze the circuit of common drain amplifier and derive the expressions for no-load voltage gain, overall voltage gain, input resistance and output resistance.	***CO 2***	***PO 2***	**12**
		b)	A CG amplifier is required to match a signal source with R_{sig} = 100Ω . At what current should the MOSFET be biased if it is operated at an overdrive voltage of 0.2 V? If the total resistance in the drain circuit is 2 k , what overall voltage gain is realized?	***CO 2***	***PO 2***	**4**
		c)	A MOSFET is to operate at I_D= 0.1mA and is to have g_m=1mA/V. If k_n' =50mA/V^2. Find the required (W/L) ratio and the overdrive voltage.	***CO1***	***PO2***	**4**

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