U.S.N.										

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

Autonomous Institute Affiliated to VTU

January / February 2025 Semester End Main Examinations

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

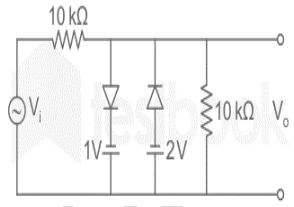
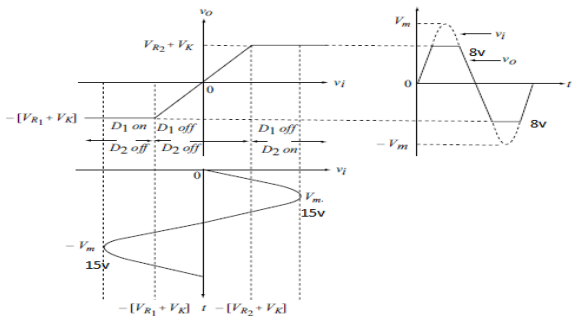
Branch: MD / EIE **Duration: 3 hrs.**

Course Code: 23ES3PCAME / 22ES3PCAME **Max Marks: 100**

Course: Analog Microelectronics

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)		Assuming ideal diode in the circuits shown below in figure-1, draw the output voltage for the given input signal of $V_i = 10 \sin wt$.  Fig-1	CO1	PO1	**10**
	b)		Explain the working and the output waveform for Positive and negative clamping circuits, without and with biasing. considering square wave input.	CO1	PO2	**10**
			OR			
2	a)		Determine the dc bias voltage V_{CE} and the current I_C for the voltage-divider Circuit having $R_1 = 39k\Omega$, $R_2 = 3.9\ k\ \Omega$, $R_C = 10k\Omega$, $R_E = 1.5k\Omega$, $V_{CC} = 22V$.	CO1	PO1	**10**
	b)		Design a circuit to obtain the following transfer function. Also explain its working. 	CO3	PO2	**10**

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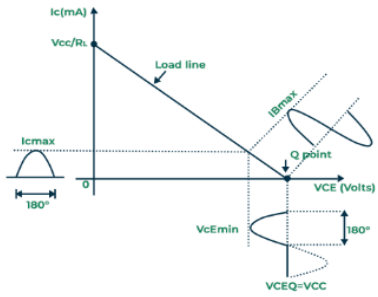
			UNIT - II			
	3	a)	Derive expressions for gain, input resistance and output resistance of voltage shunt feedback with block representation approach.	*CO2*	*PO1*	**10**
		b)	Discuss the significance of Miller capacitance at high frequencies with derivation.	*CO2*	*PO1*	**10**
			OR			
	4	a)	Discuss the properties and advantage of a negative feedback amplifier	*CO2*	*PO1*	**10**
		b)	Determine the lower cut off frequency for a RC coupled amplifier network using the following parameters. Comment on the impact of the capacitance in low frequency. Cs =10 µF, C_E =20 µF, C_C =1 µF, Rs =1 kΩ, R_1= 40 kΩ, R_2 =10 kΩ , R_E =2 kΩ ,R_C = 4 kΩ,R_L =2.2 kΩ	*CO2*	*PO1*	**10**
			UNIT - III			
	5	a)	Analyze the characteristics given in Figure 3. Obtain the maximum efficiency and the power dissipation by each transistor when they operate at such conditions.  Fig-3	*CO3*	*PO2*	**10**
		b)	Define total harmonic distortion in power amplifiers. Calculate the harmonic distortion components for an output signal having fundamental amplitude of 3V, second harmonic amplitude of 0.5 V, third harmonic amplitude of 0.1 V, and fourth harmonic amplitude of 0.05 V. Determine the total harmonic distortion.	*CO2*	*PO1*	**05**
		c)	A class A transformer coupled power amplifier has zero signal collector current of 50 mA. If the collector supply voltage is 5 V, find (i) the maximum ac power output (ii) the power rating of transistor (iii) the maximum collector efficiency.	*CO2*	*PO1*	**05**
			OR			
	6	a)	Suggest a suitable method to increase the efficiency of series fed Class A Power Amplifier and deduce an expression to prove the efficiency is higher than Series fed Class A type	*CO2*	*PO1*	**10**
		b)	List the different types of power amplifier and distinguish them based on efficiency, linearity, conduction angle of transistor, operating point and transfer characteristics.	*CO2*	*PO1*	**05**

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		C)	A transformer coupled class A power amplifier supplies power to 20Ω load connected across the secondary of a stepdown transformer having a turns ratio of 5:1. Determine the maximum power output for a zero-signal collector current of 120mA.	*CO2*	*PO1*	**05**
			UNIT - IV			
	7	a)	Describe the CMOS device structure in detail.	*CO2*	*PO1*	**05**
		b)	Analyze and Comment on the drain currents for a n-channel MOSFET with tox = 20 nm, μn = 650 cm2/Vs, Vt = 0.8 V, and W/L = 10. (a) V_{GS} = 5 V and V_{DS} = 1 V. (b) V_{GS} = 2 V and V_{DS} = 1.2 V. (c) V_{GS}= 5 V and V_{DS} = 0.2 V. (d) V_{GS} = V_{DS} = 5 V.	*CO3*	*PO1*	**08**
		C)	Describe the transfer characteristics of CS amplifier. Also explain how it could be used as an amplifier.	*CO2*	*PO1*	**07**
			OR			
	8	a)	For a 0.8μm process technology, for which t_{ox}= 15nm and μ_n=550cm2/Vs, find Cox, k'_n and the over drive voltage required to operate a transistor having W/L =20 in saturation with I_D=0.2mA. What is the minimum value of V_{DS} needed?	*CO2*	*PO1*	**08**
		b)	Derive an expression for I_D when the n-channel MOSFET operating in (a) Triode region (b) Saturation region.	*CO2*	*PO1*	**12**
			UNIT - V			
	9	a)	Analyze the condition to have a minimum non-linear distortion in a MOS amplifier, also obtain the equation for voltage gain in terms of g_m.	*CO3*	*PO2*	**10**
		b)	Derive expression for input resistance, output resistance, voltage gain and overall voltage gain of a common gate MOSFET amplifier	*CO2*	*PO1*	**10**
			OR			
	10	a)	Deduce an expression for small signal voltage gain of enhancement MOSFET amplifier.	*CO2*	*PO1*	**10**
		b)	With a neat circuit diagram and equations, explain the working of a Wilson current source.	*CO2*	*PO1*	**10**

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