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**

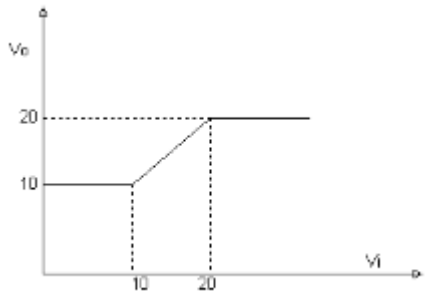
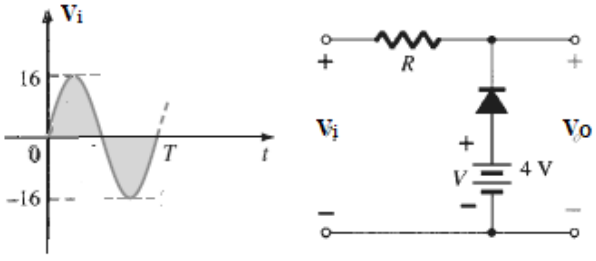
Branch: Electronics and Communication Engineering **Duration: 3 hrs.**

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

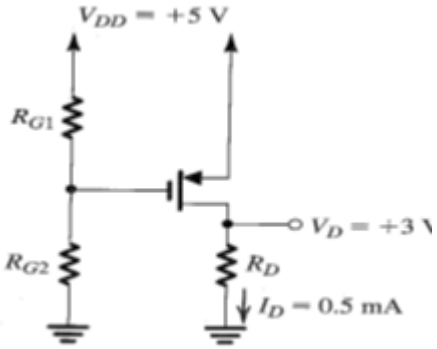
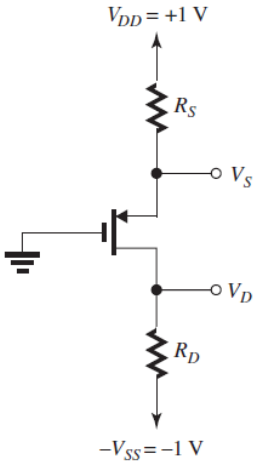
Course: Analog Electronic Circuits

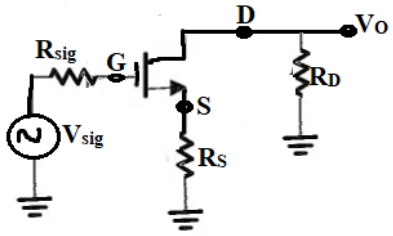
Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

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.

		UNIT - I	CO	PO	Marks
1	a)	For the transfer characteristics shown in Figure 1, identify and analyze the circuit, also obtain the output wave form if the input waveform is 50sinωt.  Fig-1	CO 2	PO 1	10
	b)	What is clamper? Explain the operation of positive clamper with equations and draw the input output waveforms.	CO 1	-	5
	c)	Highlight the significance of coupling and the bypass capacitors in a CE amplifier.	CO 2	PO 1	5
		OR			
2	a)	Draw the circuit diagram of common Emitter voltage divider bias configuration. Derive the expression for Zi, Zo, Av, using re model.	CO 2	PO 1	10
	b)	Explain the operation of the clipping circuit shown in Fig 2. Draw the output waveform and transfer curve. Assume the diode as ideal.  Fig 2	CO 2	PO 1	5

		c)	Classify the clippers with necessary diagrams.	***CO 1***	-	**5**
			UNIT - II			
	3	a)	Derive expressions for gain, input resistance and output resistance of voltage shunt feedback with block representation approach.	***CO 2***	***PO 1***	**10**
		b)	Describe the frequency response of an RC coupled amplifier. 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 1***	***PO 1***	**10**
			OR			
	4	a)	For an application it is required to use a feedback configuration which results in high input and output impedances. Deduce expressions for overall gain input and output impedances using block representation for the purpose.	***CO 2***	***PO 1***	**10**
		b)	Discuss the significance of Miller capacitance at high frequencies with suitable expressions.	***CO 1***	***PO 1***	**10**
			UNIT - III			
	5	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 2***	***PO 1***	**10**
		b)	What is Harmonic distortion? 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 0.1 V, and fourth harmonic amplitude of 0.05 V. Also calculate the total harmonic distortion.	***CO 2***	***PO 1***	**10**
			OR			
	6	a)	Derive an expression for conversion efficiency for Series fed class A power amplifier. What are the drawbacks of the same?	***CO 2***	***PO 1***	**10**
		b)	Represent the characteristics of a Class B power amplifier. For a Class B amplifier using a supply of V_{CC} =30 V and driving a load of 16 Ω, determine the maximum input power, output power, and transistor dissipation.	***CO 2***	***PO 1***	**10**
			UNIT - IV			
	7	a)	Describe the CMOS device structure in detail. For a 0.8µm process technology, for which t_{ox}= 15nm and µn=550cm^2/Vs, find Cox, kn' 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?	***CO 2***	***PO 2***	**10**
		b)	Compare p- channel and n- channel MOSFET. Design the circuit parameters for the circuit shown in Fig-3 so that the transistor operates in saturation with I_D=0.5mA and V_D=+3V.Let the	***CO 4***	***PO 3***	**10**

			enhancement type PMOS have Vt= -1V and kp'(W/L)=1mA/V^2.Assume λ=0.What is the largest value of R_D to maintain the device working in saturation?  Fig-3			
			OR			
	8	a)	Derive an expression for I_D when the n-channel MOSFET operating in (a) Triode region (b) Saturation region.	***CO 2***	***PO 2***	**10**
		b)	Design the circuit parameters for the circuit in Fig-4. With V_{tp} = −0.5V, kp' = 100 μA/V^2, W/L = 20, and λ = 0 to obtain I_D = 0.1mA and V_D = 0V. What is the largest R_D for which the transistor remains in saturation? At this value of R_D, what is the voltage at the drain, V_D?  Fig-4	***CO 4***	***PO 3***	**10**
			UNIT - V			
	9	a)	Deduce 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.	***CO 2***	***PO 2***	**10**
		b)	Explain the operation of Wilson MOS Mirror	***CO 1***	-	**10**
			OR			
	10	a)	Explain the basic MOSFET amplifier configurations.	***CO 1***	-	**10**
		b)	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.	***CO 2***	***PO 2***	**4**

		c)	For the circuit shown in figure 5, derive the expression for R_{in}, Ro, A_V and A_{VO} using T- Model.  Fig-5	***CO 2***	***PO2***	**6**

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