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**

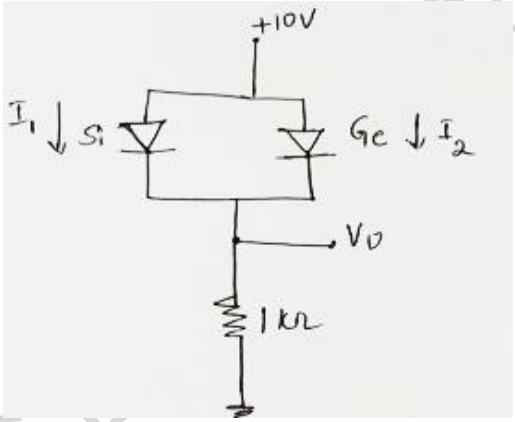
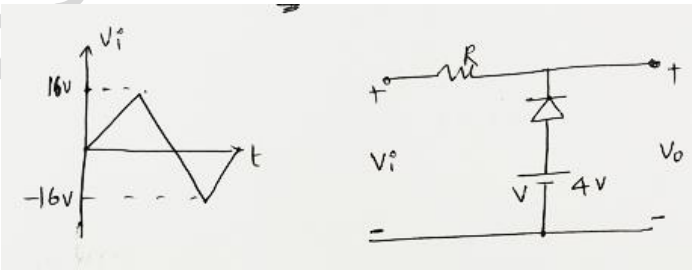
Branch: Electronics & Telecommunication Engineering **Duration: 3 hrs.**

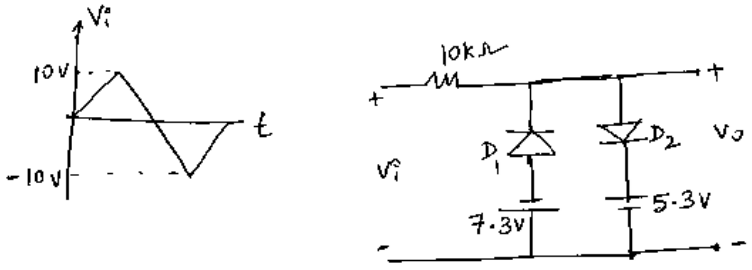
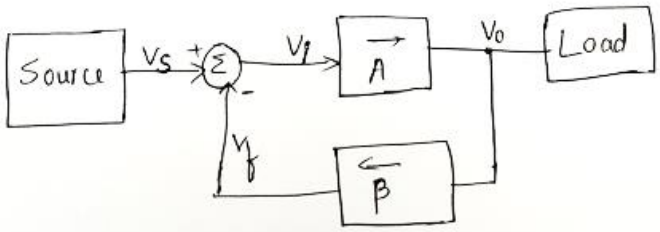
Course Code: 23ET3PCALC **Max Marks: 100**

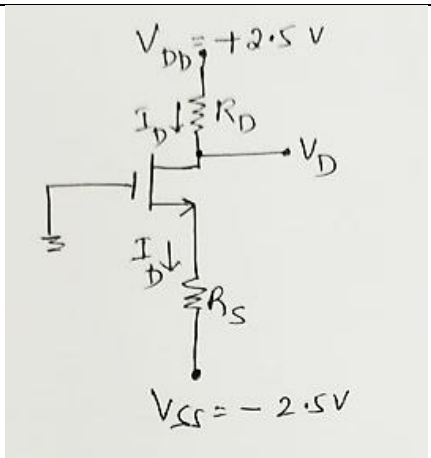
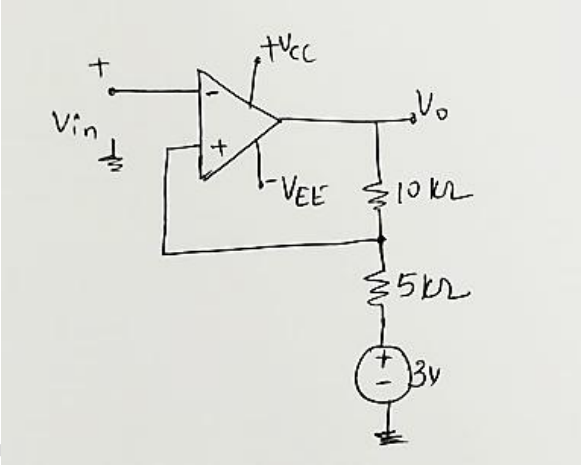
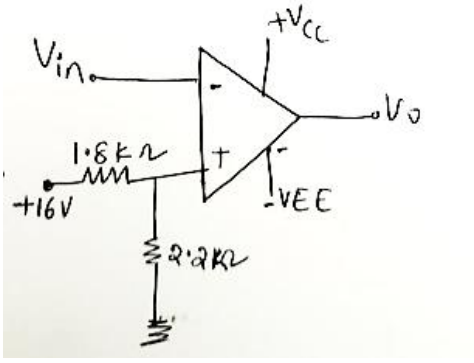
Course: ANALOG AND LINEAR CIRCUITS

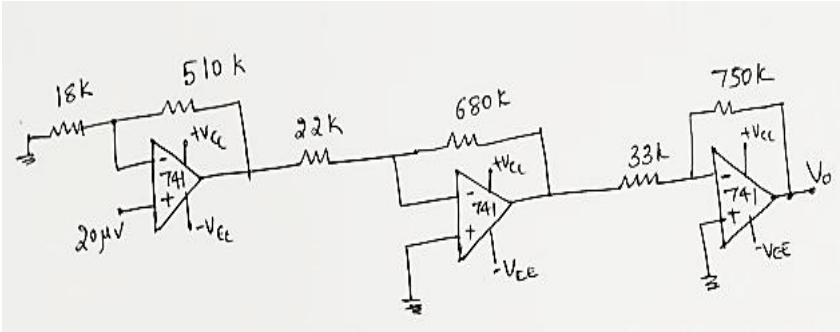
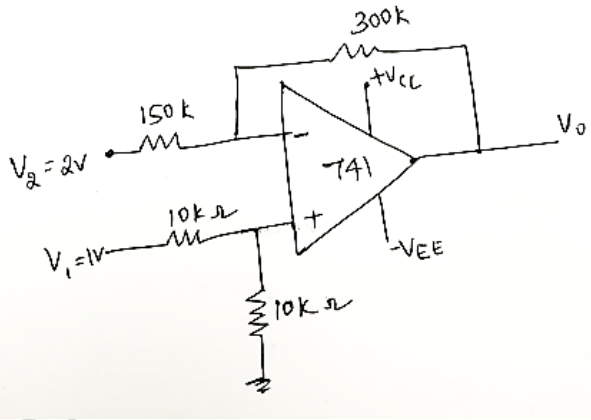
Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

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)	Design a voltage divider bias network with a supply of 24V,a transistor with β of 110 and an operating point of I_{CQ}=4mA and V_{CEQ}=8V.Choose V_E=1/8V_{cc} .	CO2	PO1	**10**
	b)	Determine V_0,I,I_1,I_2 for the network shown below in Fig.1b  Fig.1b	CO2	PO1	**04**
	c)	Analyze the circuit shown below in Fig.1c. Determine and sketch V_0 for the circuit shown(assume a silicon diode)  Fig.1c	CO2	PO1	**06**
		OR			
2	a)	Draw a negative (positive peak) clamper circuit and explain its working along with i/p and o/pwaveform.	CO2	PO1	**07**
	b)	For the circuit shown in the Fig.2b below, determine the transfer characteristics and sketch the waveform for V_0.	CO2	PO1	**05**

			 Fig.2b			
		c)	Draw r_e model for a voltage divider bias configuration and derive expressions for input impedance, output impedance and voltage gain.	*CO2*	*PO1*	**08**
			UNIT - II			
	3	a)	With a neat circuit diagram, Explain the working of transformer coupled class A power amplifier.	*CO1*		**06**
		b)	A class B transformer coupled amplifier is supplied with V_{CC}=50V.The signal brings the collector voltage down to V_{min}=5V.The total dissipation from both transistors is 40W.Find the total power and conversion efficiency.	*CO2*	*PO1*	**06**
		c)	With a neat circuit diagram and transfer characteristics, derive the expression for power conversion efficiency of class B complementary push pull amplifier.	*CO1*		**08**
			OR			
	4	a)	Derive the expression for maximum efficiency of a series fed class A amplifier.	*CO2*	*PO1*	**08**
		b)	Identify the amplifier shown in Fig.4b and enumerate its properties.  Fig.4b	*CO1*		**07**
		c)	For a harmonic distortion reading of D_2=0.1, D_3=0.02 and D_4=0.01 with I_1=4A and R_C=8Ω, calculate the total harmonic distortion, fundamental power component and total power.	*CO2*	*PO1*	**05**
			UNIT - III			
	5	a)	Derive an expression for drain current of NMOS transistor that operates in (i) triode region and (ii) saturation region.	*CO2*	*PO1*	**12**
		b)	Design the below given circuit so that the transistor operates at I_0=0.4mA and V_D=10.5V. The NMOS transistor has V_t=0.7V,$\mu_0 C_{0x}$=100μA/V,L=1μm and W=32μm.Neglect the channel length modulation effect(assume that λ=0)	*CO2*	*PO2*	**08**

						
			OR			
6	a)		Derive an expression for transconductance and voltage gain of a common source NMOS amplifier.	*CO2*	*PO1*	**12**
	b)		Consider a common source amplifier circuit with resistor R_S and current source biasing where g_m=0.5mA/V,V_{DD}=15V, V_{SS}=-15V,R_G=5MΩ,R_D=10KΩ,R_t=12KΩ,R_S=2KΩ and R_{sig}=100Ω.Find R_{in},R_{out},A_V,A_{V0} and G_V.Write its circuit diagram.	*CO2*	*PO1*	**08**
			UNIT - IV			
7	a)		For the operational amplifier circuit shown in the Fig.7a, the output saturation voltages are$\mp 15V$.Find the upper and lower triggering voltages.  Fig. 7a	*CO3*	*PO2*	**08**
	b)		In the following Fig.7b assume an input of V_{in}=20sinωt.Analyse the circuit and draw the i/p and o/p waveform and transfer characteristics. assume V_{sat}=$\pm 14V$.  Fig.7b	*CO3*	*PO2*	**07**

		c)	Design a non-saturating op-amp positive half wave rectifier circuit. Draw its transfer characteristics. explain its working with the necessary waveforms.	*CO2*	*PO1*	**05**
			OR			
	8	a)	With a neat circuit diagram, explain the working of instrumentation amplifier by deriving an expression for its output. What are the characteristics of instrumentation amplifier?	*CO1*		**08**
		b)	Calculate the output voltage for the Fig.8b. Find out the overall gain.  Fig.8b.	*CO2*	*PO1*	**07**
		c)	Determine the output voltage for the given circuit shown in Fig.8c  Fig.8c	*CO2*	*PO1*	**05**
			UNIT - V			
	9	a)	Explain the working of R-2R DAC circuit and mention its advantages.	*CO1*		**10**
		b)	Explain the functional block diagram of IC 555 timer.	*CO1*		**10**
			OR			
	10	a)	Explain the working principle of 3 bit flash type ADC with its advantages and disadvantages.	*CO1*		**10**
		b)	Explain the working principle of astable multivibrator using 555 IC and mention its application.	*CO1*		**10**

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