

### III B. Tech I Semester Supplementary Examinations, April/May-2025

**(ELECTRONICS AND COMMUNICATION ENGINEERING)**

Time: 3 hours

Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**

All Questions Carry Equal Marks

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		<b><u>UNIT-I</u></b>	
1.	a)	Describe the internal structure of an Operational Amplifier (Op-Amp) and the function of each stage. Additionally, analyze how the design of these stages influences key performance parameters such as open-loop gain, bandwidth, input impedance, and output impedance	[7M]
	b)	Define and explain the significance of the following Op-Amp parameters: i) Input Offset Voltage                                  ii) Input Bias Current iii) Input Offset Current                                iv) Slew Rate	[7M]
		(OR)	
2.	a)	For the non-inverting a.c amplifier Input resistance ( $R_{in}$ ) = 50 $\Omega$ , Input capacitance ( $C_i$ ) = 0.1 $\mu F$ , Non Inverting input terminal resistance ( $R_1$ )=110 $\Omega$ , Feedback resistance ( $R_F$ ) = 1.5k $\Omega$ and output resistance ( $R_O$ )= 11 k $\Omega$ . Determine the gain and band width of the amplifier.	[7M]
	b)	With a neat diagram, explain the working of three-terminal voltage regulators from the 78xx and 79xx series.	[7M]
		<b><u>UNIT-II</u></b>	
3.	a)	Describe the design and operation of a Voltage-to-Current (V-to-I) converter and a Current-to-Voltage (I-to-V) converter using Op-Amps.	[7M]
	b)	Design a Triangular Wave Generator using Op-Amps.	[7M]
		(OR)	
4.	a)	Describe the working principle of a logarithmic amplifier and an antilogarithmic amplifier using Op-Amps.	[7M]
	b)	With the help of a circuit diagram, explain the working of an instrumentation amplifier.	[7M]
		<b><u>UNIT-III</u></b>	
5.	a)	Design and analyze a first-order low-pass Butterworth active filter using an Op-Amp.	[7M]
	b)	Design a Band Pass filter with $f_c$ =1 kHz, Q=3 and $A_f$ =10. Draw the circuit with all the components.	[7M]
		(OR)	
6.	a)	What is an all-pass filter? Design an all-pass filter using an Op-Amp and explain how it affects the phase of a signal without changing its amplitude.	[7M]
	b)	Compare first-order and second-order Butterworth filters in terms of roll-off rate, frequency response, and applications.	[7M]
		<b><u>UNIT-IV</u></b>	
7.	a)	Describe the working of a 555 timer in monostable mode and derive the expression for output pulse width.	[7M]
	b)	Discuss the IC 565 PLL and its applications in:	[7M]

		a) Frequency multiplication b) Frequency translation	
		(OR)	
8.	a)	What is a Schmitt Trigger? Explain how a Schmitt Trigger circuit can be implemented using a 555 timer.	[7M]
	b)	Design an Astable multivibrator having an output frequency 15 KHz with duty cycle of 40%.	[7M]
		<b><u>UNIT-V</u></b>	
9.	a)	Design the circuit diagram of 5-bit inverted R-2R ladder DAC. How many levels are possible in this DAC? What is its resolution if the output range is 0 to 10 V.	[7M]
	b)	Define key DAC and ADC specifications such as resolution, accuracy, linearity, conversion time, and sampling rate.	[7M]
		(OR)	
10.	a)	Design a Dual Slope ADC, illustrating its working principle with a detailed diagram and analyze its advantages and limitations compared to other ADC types.	[7M]
	b)	Illustrate the working of a Successive Approximation ADC with a neat block diagram, highlighting the role of each component and the step-by-step conversion process.	[7M]

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