PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – MAY/ JUNE 2025

Date: 02-06-2025   **Time:** 01:00 pm – 04:00 pm

School: SOE	**Program:** B. Tech-EEE
Course Code: EEE2027	**Course Name**: Opamps and Linear Integrated Circuits
Semester: IV	**Max Marks**: 100 **Weightage**: 50%

CO - Levels	CO1	CO2	CO3	CO4	CO5
Marks	26	24	24	26	

Instructions:

    (i) Read all questions carefully and answer accordingly.

    (ii) Do not write anything on the question paper other than roll number.

Part A

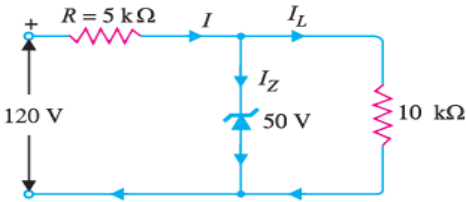**Answer ALL the Questions. Each question carries 2marks.**   **10Q x 2M=20M**

1.	Differentiate between line and load regulation.	2 Marks	L1	CO3
2.	Explain advantages of active filters over passive filters?	2 Marks	L1	CO2
3.	Parameters of an op-amp gives an idea about the op-amp when it is used in any electronic circuit. Define CMRR.	2 Marks	L1	CO1
4.	What is the circuit configuration for an RC-based oscillator using operational amplifiers?	2 Marks	L1	CO3
5.	If the conversion time of 8 bit flash ADC is 10 microseconds find the maximum frequency of a sinusoidal voltage that can be digitalized?	2 Marks	L1	CO4
6.	"The current entering the inverting and non-inverting terminal of an ideal op-amp is 0 A". Describe using a single line how you will defend the statement.	2 Marks	L2	CO2
7.	Define stability of an digital to analog convertor.	2 Marks	L1	CO4
8.	If the conversion time of 8 bit flash ADC is 10 microseconds find the maximum frequency of a sinusoidal voltage that can be digitalized?	2 Marks	L1	CO4
9.	The bias currents for the emitter coupled transistors of a differential amplifier are 10 uA and 19 uA. Find (i) input bias current (ii)input offset current for an op amp.	2 Marks	L1	CO1
10.	Identify the key ideal properties of an operational amplifier.	2 Marks	L2	CO1

Answer the Questions.   **Total Marks 80M**

11	a.	An ADC is an electronic circuit that converts a continuous analog signal, like voltage from a sensor, into a digital representation. This allows digital systems to process and store information from the real world. Discuss a 3bit flash ADC also explain the working of the 3-bit flash with its advantages and disadvantages.	10 Marks	L2	CO4
	b.	A weighted resistor DAC produces an analog output, which is almost equal to the digital (binary) input by using binary weighted DAC in the inverting adder circuit. Design 4 bit R2R DAC with its advantages and disadvantage.	10 Marks	L3	CO4
		Or			
12.	a.	Digital-to-analog converter is a system that converts a digital signal into an analog signal. Identify and describe the important parameters of a DAC and their impact on performance.	10 Marks	L2	CO4
	b.	The successive approximation algorithm is basically an intelligent tree search through all possible quantization levels, where each conversion step selects the next branch to follow based on the result of the previous estimate. Illustrate the working of a successive approximation with 4 bit data.	10 Marks	L3	CO4

13.	a.	Mr. Jay is working on a signal generation project and needs to produce a square wave for testing purposes. He has access to an operational amplifier (op-amp) and basic electronic components. Identify which circuit configuration should Mr. Jay use to generate a square wave using the op-amp, and how does it work?	10 Marks	L2	CO2
	b.	For the circuit shown, calculate: (i) the output voltage (ii) the voltage drop across series resistance (iii) the current through zener diode.	10 Marks	L3	CO1
		Or			
14.	a.	Mr. Ram is working on a waveform generation circuit and needs to produce a triangular wave signal. He has access to operational amplifiers and basic electronic components. How can he design a circuit using an op-amp to generate a triangular waveform effectively?	10 Marks	L2	CO2
	b.	A 6.0V stabilised power supply is required to be produced from a 12V DC power supply input source. The maximum power rating P_Z of the zener diode is 2W. Using the zener regulator circuit above calculate:	10 Marks	L3	CO1

		a). The maximum current flowing through the zener diode. b). The minimum value of the series resistor, R_S c). The load current I_L if a load resistor of $1k\Omega$ is connected across the zener diode. d). The zener current I_Z at full load.			

15.	a.	Resistors divide the supply voltage into 1/3 Vcc, 2/3 Vcc, and Vcc, forming reference points for internal comparators. "Explain the internal functional architecture of the 555 timer IC using a clear block diagram. Describe the roles of its key components, and mention how the IC gets its name from the internal voltage divider network."	10 Marks	L3	CO3
	b.	A Schmitt trigger is an electronic circuit that converts an analog input signal to a digital output signal, often used for signal conditioning and noise reduction. Discuss a Schmitt trigger for a lower threshold point of -4V and an upper threshold point of 4V. Let $VCC = 15\,V$	10 Marks	L2	CO3
Or					
16.	a.	The 555 Timer IC is an 8 pin mini Dual-Inline Package. Using a clear and well-labeled block diagram, illustrate and describe the pin configuration of the 555 timer IC along with the function of each pin."	10 Marks	L3	CO3
	b.	The 555 Timer IC can be used in mono stable operation in order to produce a pulse at the output. Illustrate a monostable multivibrator circuit using a 555 timer IC to generate an output pulse with a duration of 10 milliseconds.	10 Marks	L3	CO3

17.	a.	An inverting amplifier circuit is known for producing an output signal that is opposite in phase to the input. Describe the working principle of an inverting amplifier and explain how it achieves both voltage gain and phase inversion. Additionally, demonstrate how to design an inverting amplifier with a voltage gain of -15, specifying the resistor values used.	10 Marks	L2	CO1
	b.	The Summing Amplifier is a very flexible circuit indeed, enabling us to effectively "Add" or "Sum" together several individual input signals. Implement a circuit to obtain the output Vo = −3v1 −4v2 −5v3.	10 Marks	L3	CO2
Or					
18.	a.	A non-inverting amplifier produces an output that is in phase with the input. Describe the operation of an non inverting amplifier and explain how it achieves voltage gain without phase inversion Also describe an non - inverting amplifier for a gain of -15.	10 Marks	L2	CO1
	b.	Non - Inverting Subtracting amplifier is a type operational amplifier circuit which can be used to sum signals. Explain and derive the expression for the output voltage of this subtractor opamp.	10 Marks	L3	CO2