Question Paper

Exam Date & Time: 24-Jun-2024 (02:30 PM - 05:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

4TH SEMESTER, E&I, B.TECH MAKE-UP EXAMINATIONS, DEPARTMENT OF I&CE, JUNE 2024

LINEAR INTEGRATED CIRCUITS [ICE 2221]

Marks: 50 **Duration: 180 mins.**

A

Answer all the questions.

Instructions to Candidates: Missing data may be suitably assumed

1) With the help of a circuit diagram, derive the expression for the gain of an instrumentation amplifier. (CO1, BL3, PO1) (3)

A)

B) Illustrate the working of a current amplifier in grounded load and floating load configuration with a circuit diagram and mathematical expressions. (CO1, BL4 PO1) (4)

C) Design input and feedback resistance of a lossy integrator such that the peak gain in 20 dB and gain is 3 dB down from the peak value when ω= 10000 rad/s. Assume capacitance as 10nF. (CO1, BL4, PO1, 3) (3)

2) With a circuit diagram, derive the expression for the transfer function of a second order low pass filter. (CO2, BL3, PO1) (5)

A)

B) With a suitable circuit diagram, derive the expression for a series-series op-amp feedback configuration. (CO1, BL3, PO1) (3)

C) Design a suitable op-amp based circuit that gives an output, $V_o = -4(6V_1 + 8V_2 + 4V_3)$. (CO1, BL4, PO1, 3) (2)

3) Design a multiple feedback band pass filter having f_o = 2.8 kHz, Q = 10, H_o = 30 dB. Consider C_1 = C_2 = 0.47 µF. (CO2, BL4, PO1, 3) (3)

A)

B) With a suitable circuit diagram, explain the working of an on-off temperature controller. (CO3, BL2, PO1) (3)

C) With relevant circuit diagrams and waveforms, illustrate the modes of operation for a peak detector circuit. (CO3, BL3, PO1) (4)

4) Design an astable multivibrator using 555 timer having a duty cycle of 54% and frequency of 2.4kHz. Choose C = 0.036µF. (CO4, BL4, PO1, 3) (3)

A)

B) With the relevant circuit diagrams, derive the expression of the frequency of oscillations and feedback resistance in terms of the input resistance of a Wien Bridge oscillator. (CO4, BL3, PO1) (3)

	C)	Obtain the expression of pulse width for a monostable multivibrator circuit using an op-amp with suitable circuit and waveforms. (CO4, BL3, PO1)	(4)
5)		Illustrate the working of a counter type ADC with a suitable block diagram and waveforms. (CO5, BL3, PO1)	(4)
	A)		
	B)	An 8-bit DAC produces V_{out} = 0.25 V for a digital input of 00000001. Find the full-scale output. What is V_{out} for an input of 01011001 and 11010011? (CO5, BL4, PO1, 3)	(3)
	C)	What are the output voltages caused by logic 1 in each bit position in an R-2R ladder with input 10110110, if the input level for 0 is 1V and that for 1 is 5V? (CO5, BL4, PO1, 3)	(3)

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