Question Paper

Exam Date & Time: 07-May-2024 (02:30 PM - 05:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

IV SEM B.TECH (Electronics and Instrumentation Enginneerig) End Sem Examinations, May 2024

LINEAR INTEGRATED CIRCUITS [ICE 2221]

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

Descriptive Questions

Answer all the questions.

Missing data can be suitably assumed.

1) Design an instrumentation amplifier whose gain can be varied over the range 1 V/V ≤ A ≤ 10000 V/V by means of a 100 kΩ pot. (CO1, BL4, PO1, 3) (3)

A)

B) Design an op-amp differentiator circuit that will differentiate an input signal with a frequency of 500Hz. What is the advantage of a practical differentiator over an ideal differentiator? (CO1, BL4 PO1, 3) (4)

C) With the help of a circuit diagram, illustrate the working of a grounded load V-I converter with necessary mathematical expressions. (CO1, BL3, PO1, 2) (3)

2) Design a 4th order low-pass Butterworth filter having a cut-off frequency of 1300 Hz and realize the circuit. Assume: C = 100nF.Use (4)

A) $(s_n^2 + 0.765\, s_n + 1)(s_n^2 + 1.848 s_n + 1)$. (CO2, BL4, PO1, 3)

B) Design an op-amp based circuit such that: $v_2 = v_0 + 4v_1$. R_{i1} = 40kΩ and R_{i2} = 60kΩ. (CO1, BL4, PO1, 3) (3)

C) With the help of a circuit diagram, derive the expression for shunt - shunt feedback configuration. (CO1, BL3, PO1, 2) (3)

3) With the support of a suitable circuit diagram, derive an expression for the gain of multiple feedback bandpass filter. Also, draw the frequency response of this filter. (CO2, BL3, PO1, 3) (4)

A)

B) Design an Inverting Schmitt trigger circuit whose upper threshold voltage is +7V and lower threshold voltage is - 4V. Op-amp is powered with ±14V supply. (CO3, BL4, PO1, 3) (3)

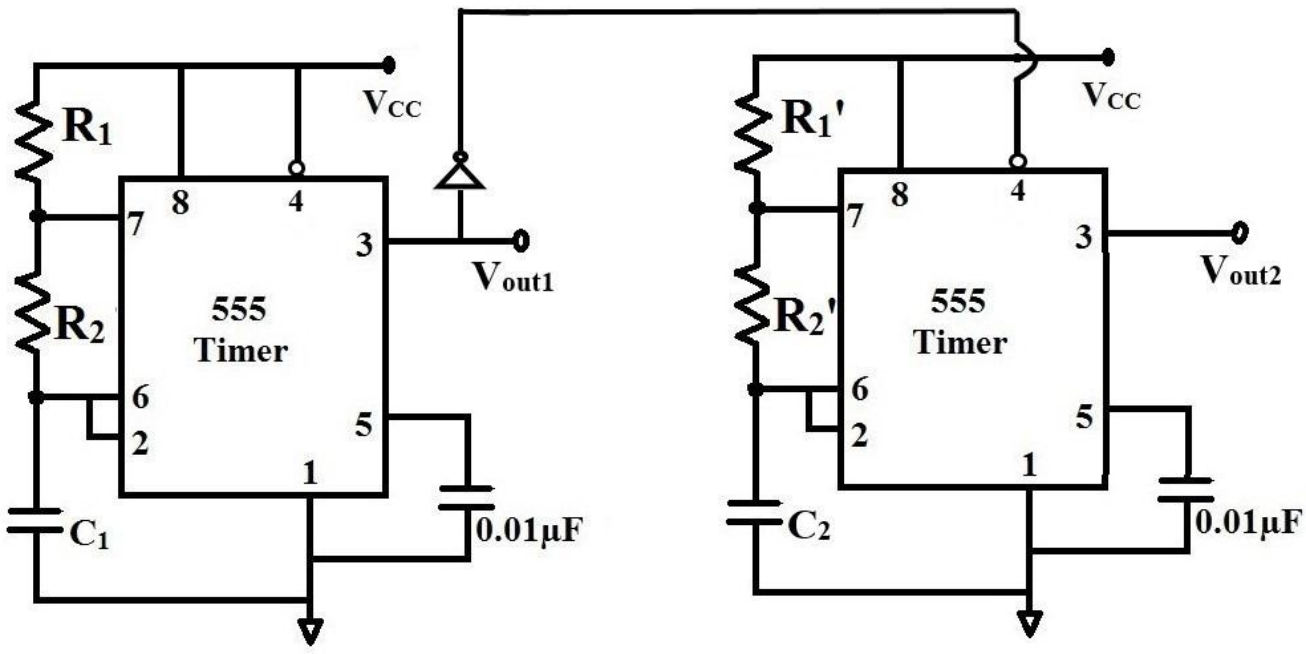
C) With the help of a suitable circuit and relevant waveforms, explain the modes of operation of a sample and hold circuit. (CO3, BL2, PO1) (3)

4) Design a monostable multivibrator circuit using opamp having a pulse width of 1.5ms with a capacitance of 0.0027µF. (CO4, BL3, PO1, 3) (2)

A)

B) Obtain the expressions of frequency of oscillations, and feedback resistance in terms of input resistance for a RC phase shift oscillator. Draw relevant circuit diagrams. (CO4, BL3, PO1, 2) (5)

C) Sketch the output waveforms at V_{out1} and V_{out2} for the circuit shown in the figure. Also, find the charging time and discharging time for both the timers if $C_1 = C_2$ = 0.047µF, R_1 = 10kΩ, R_2 = 7.2kΩ, $R_1' = R_2'$ = 15kΩ. Assume, V_{CC} = 5V. (CO4, BL4, PO1, 3) (3)



5)		An 8-bit DAC produces V_{out} = 0.5 V for a digital input of 00000010. Find the full-scale output. What is the resolution? What is V_{out} for an input of 01101001 and 10010011? (CO5, BL3, PO1, 2)	(4)
	A)		
	B)	With a suitable circuit diagram, illustrate the working of a successive approximation ADC for an input of 12.2V. (CO5, BL4, PO1, 3)	(3)
	C)	Design a 4-bit weighted resistor DAC whose full-scale output voltage is -12V. The logic levels are 1 = +10V and 0 = 0V. What is the output voltage when the input is 1011? (CO5, BL4, PO1, 3)	(3)

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