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10EC46

Fourth Semester B.E. Degree Examination, June/July 2018
Linear IC's and Applications

Time: 3 hrs.

Max. Marks:100

Note: 1. Answer any FIVE full questions, selecting at least TWO questions from each part.

2. Use of standard resistance (10% tolerance) and capacitance values.

PART - A

- 1 a. With circuit diagram, explain the working of basic circuit of operational amplifier. (07 Marks)
b. A direct coupled noninverting amplifier is to amplify a 100 mV signal to a level of 3 V. Using IC741, design a suitable circuit. Assume $I_{B(max)} = 500$ nA. (07 Marks)
c. Write the circuit diagram of 3 input non inverting summing circuit and prove that $V_0 = V_1 + V_2 + V_3$. (06 Marks)
- 2 a. Explain the design steps to build a high input impedance capacitor coupled non-inverting voltage follower. (06 Marks)
b. Design a capacitor coupled inverting amplifier using IC741 to have a voltage gain of 85, output voltage amplitude of 3 V and signal frequency range from 30 Hz to 14 kHz. Assume load resistance is 1 k Ω and $I_{B(max)} = 500$ nA. (07 Marks)
c. Design a capacitor coupled non-inverting a amplifier using single polarity power supply is to have a 22 V supply, voltage gain of 95 V, lower cutoff frequency of 150 Hz, minimum load resistance of 7 k Ω and $I_{B(max)} = 520$ nA and output amplitude of 4.5 V. (07 Marks)
- 3 a. How upper cutoff frequency of IC741 is determined? (07 Marks)
b. For a voltage follower circuit using a 741 opamp, calculate the following. Assume slew rate = 0.5 V/ μ sec.
(i) Slew rate limited cutoff frequency if the peak of the sine wave output is 5 V.
(ii) Maximum value of the sinusoidal output voltage that will allow the circuit to operate at the 800 kHz unity-gain cutoff frequency.
(iii) Cutoff frequency limited rise time at 800 kHz unity gain cut off frequency and slew rate limited rise time if the output amplitude is 5V. (06 Marks)
c. Design an inverting amplifier to have a gain of 100. Input signal amplitude is 50 mV. Calculate the capacitance and resistance values to be added using Zin mod compensation method to reduce the gain to 60 dB. Assume $I_{B(max)} = 200$ nA, new cutoff frequency = 2 MHz. (07 Marks)
- 4 a. Design an instrumentation amplifier to have an overall gain of 800. The input signal amplitude is 25 mV and the supply is ± 15 V. Assume $I_{B(max)} = 500$ nA and opamp 741 is used. (10 Marks)
b. Write the circuit diagram of precision full wave rectifier and obtain the expression for the output voltage during the positive and negative half cycle of the input. (10 Marks)



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