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10EC46

Fourth Semester B.E. Degree Examination, July/August 2022
Linear ICs and Applications

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer FIVE full questions, selecting at least TWO questions from each part.***
2. ***Use of standard resistance and capacitance values table is permitted.***

PART – A

1 a. With a neat circuit diagram, explain the working of a basic op-amp circuits. **(07 Marks)**

b. Sketch an op-amp difference amplifier circuit. Explain the operation of the circuit and derive an equation for the output voltage. **(07 Marks)**

c. Two signals each ranging from 0.1V to 1V are to be summed and amplified by a factor of 5. Using 741 op-amp design a suitable inverting summing amplifier circuit. **(06 Marks)**

2 a. Draw neat circuit diagram of a capacitor coupled voltage follower and give its design steps. **(07 Marks)**

b. With neat circuit diagram, explain the high input impedance capacitor coupled non-inverting amplifier. **(07 Marks)**

c. Using a LF353BIFET op-Amp design a high Z_{in} capacitor coupled non-inverting amplifier to have a low cut off frequency of 200 Hz. The input and output voltages are to be 15 mV and 3V respectively and the minimum load resistance is 12 KΩ. **(06 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/μsec.

(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 Z_{in} 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. Draw the circuit of an instrumentation amplifier and explain its working and show how voltage gain can be varied. **(08 Marks)**

b. Explain the working of precision full wave rectifier using bipolar op-amp. **(06 Marks)**

c. Sketch the circuit of a current amplifier with floating load. Explain circuit operation and derive an equation for current gain. **(06 Marks)**

PART – B

5 a. Draw the op-Amp sample and hold circuit and explain its operation. **(08 Marks)**

b. Explain the working of phase shift oscillator using op-Amp. **(06 Marks)**

c. With a neat circuit diagram, explain the Wein-Bridge oscillator using op-amp. **(06 Marks)**

6 a. Using a bipolar opamp with ±18V supply, design an inverting Schmitt trigger circuit to have UTP = 1.5 V and LTP = −3V. Assume diode current = 500 μA, V_F = 0.7 V. **(10 Marks)**

b. Build a circuit to have one stable output stage using opamp and write the necessary equations to design the circuit. **(10 Marks)**

7 a. What is an voltage regulator? With a neat sketch, explain the working of series op-amp regulator. **(06 Marks)**

b. Design a voltage regulator using IC 723 to get an output voltage of 5V. **(06 Marks)**

c. Explain the basic principle of operation of switching regulator. Discuss its advantages and limitations. **(08 Marks)**

8 a. Draw the internal schematic diagram of 555 IC configuring it for monostable operation. Explain its working. **(08 Marks)**

b. With the help of basic block diagram, explain PLL. **(06 Marks)**

c. Explain the working of D to A converter using R-2R network. **(06 Marks)**

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