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06EC46

Fourth Semester B.E. Degree Examination, May/June 2010
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 resistor, capacitor standard values list and op-amp data sheets is permitted.

PART – A

1 a. Define the following parameters :
   i) Input offset voltage
   ii) CMRR
   iii) Slewrate.
   Mention their typical values for op-amp 741. **(06 Marks)**
   b. Sketch the circuit of a two-input inverting summing amplifier. Explain the operation of the circuit and derive the equation for the output voltage. **(08 Marks)**
   c. A non-inverting amplifier is to amplify a 100 mV signal to a level of 3V. Using a 741 op-amp, design a suitable circuit. **(06 Marks)**

2 a. Sketch the circuit of a high Z_{in} capacitor coupled voltage follower. Briefly explain its operation and show that the input impedance is very high compared to the capacitor coupled voltage follower. **(06 Marks)**
   b. Explain how the upper cutoff frequency can be set for inverting and on-inverting amplifiers. **(06 Marks)**
   c. Design Z_{in} capacitor coupled voltage follower using an op-amp having lower cutoff frequency of 50 Hz and maximum input bias current of 500 nA. The load resistance is 3.6 KΩ. If the open loop gain is 2×10^5, find ideal value of input impedance of the circuit. **(08 Marks)**

3 a. With a neat sketch, explain the working of a lag compensation network. Show how it affects the frequency response of an op-amp. **(08 Marks)**
   b. List the precautions to be observed for op-amp circuit stability. **(08 Marks)**
   c. Determine the upper cutoff frequency and the maximum distortion free output amplitude for a voltage follower when a 741 op-amp is used. **(04 Marks)**

4 a. With a neat sketch, explain the working of a precision voltage source using op-amp with a zener diode. Derive an expression relating V_o and V_z. **(08 Marks)**
   b. Draw the circuit of an instrumentation amplifier. Explain its characteristics. Also show how the voltage gain can be varied. **(08 Marks)**
   c Determine the range of resistance R_G for a LH0036 IC instrumentation amplifier to give a voltage gain adjustable from 30 to 300. **(04 Marks)**

PART – B

5 a. Draw and explain an op-amp sample and hold circuit with signal, control and output waveforms. **(08 Marks)**
   b. With a neat sketch, explain the working of Wein-Bridge Oscillator circuit. **(06 Marks)**
   c. Using a 741 op-amp with a supply of $\pm$ 12V, design a phase-shift oscillator to have an output frequency of 3.5 KHz. **(06 Marks)**

6 a. What are the advantages of active filters over passive filters? (04 Marks)
   b. Sketch the circuit of a second order active high pass filter, explain its working. (08 Marks)
   c. An inverting Schmitt trigger circuit is to have UTP = 0 and LTP = 2.5 V. Design a suitable circuit using a bipolar op-amp and a $\pm$ 18 V supply. (08 Marks)

7 a. Explain the application of IC 723 as basic low voltage regulator. (06 Marks)
   b. Explain the principle of switch mode power supplies. Enumerate their advantages and disadvantages. (08 Marks)
   c. Using 7805 design a current source to deliver 0.2 A current to a 22 Ω, 10W loads. Take quiescent current as 4.2 mA. (06 Marks)

8 a. Draw and explain the functional diagram of 555 timer. (06 Marks)
   b. With a sketch, explain the working of R-2R ladder DAC. (08 Marks)
   c. An 8 bit ADC outputs all 1's when V_i = 2.55 V. Find its :
       i) Resolution in mV/LSB and
       ii) Digital output when V_i = 1.28 V. (06 Marks)

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