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06EC46

Fourth Semester B.E. Degree Examination, June/July 2014

Linear ICs and Applications

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Explain the following terms relevant to operational amplifier:
   i) Common mode rejection ratio
   ii) Power supply rejection ratio
   iii) Slew rate **(06 Marks)**

b. Design an inverting amplifier using a 741 op-amp. The voltage gain is to be 50 and the output voltage amplitude is to be 2.5V. **(07 Marks)**

c. Derive an expression for output voltage of non-inverting summing circuit using an operational amplifier, considering two inputs. **(07 Marks)**

2 a. Design a capacitor-coupled voltage follower using a 741 operational amplifier. The lower cut-off frequency for the circuit is to be 50 Hz and the load resistance is $R_L = 3.9\ K\Omega$. **(07 Marks)**

b. Explain the setting the upper cut-off frequency for inverting amplifier with feedback capacitor c_f using operational amplifier. **(07 Marks)**

c. Explain the use of a single polarity supply for capacitor coupled non-inverting amplifier with circuit diagram using operational amplifier. **(06 Marks)**

3 a. Explain the phase-lag compensation method with circuit diagram and gain versus frequency response characteristics. **(06 Marks)**

b. i) Calculate the slew rate limited cut-off frequency for a voltage follower circuit using a 741 op-amp if the peak of sine wave output is to be 5V.
   ii) Determine the maximum peak value of the sinusoidal output voltage that will allow the 741 voltage follower circuit to operate at the 800 kHz unity gain bandwidth (unity gain cut-off frequency).
   iii) Calculate the maximum peak value of sine wave output voltage that can be produced by the amplifier in part (i). **(08 Marks)**

c. With circuit diagram, explain the input impedance modification (Zin Mod) technique of frequency compensation using operational amplifier. **(06 Marks)**

4 a. Design a precision voltage source to provide an output of 9V. The available supply is ±12V. Allow the tolerance of ±10% approximately on the zener diode voltage. **(08 Marks)**

b. With relevant circuit diagram, and expressions, explain the operation of current amplifier. **(05 Marks)**

c. With a neat circuit diagram, explain the operation of instrumentation amplifier consisting of a differential input/output amplifier input stage and a difference amplifier output stage. The circuit has adjustable voltage gain, common mode output nulling, and dc output voltage level shifting. **(07 Marks)**

PART – B

5 a. A ±5V, 10 kHz square wave from a signal source with a resistance of 100Ω is to have its positive peak clamped precisely at ground level. Tilt on the output is not to exceed 1% of the peak amplitude of the wave. Design a suitable op-amp circuit using a supply of ±12V. **(06 Marks)**

b. With neat circuit diagram and waveforms, explain the operation of triangular/rectangular waveform generator. **(08 Marks)**

c. With circuit diagram and relevant waveforms, explain the operation of wein bridge oscillator circuit. **(06 Marks)**

6 a. Design a second order low pass filter circuit to have a cut-off frequency of 1 kHz, using operational amplifier. **(07 Marks)**

b. With circuit diagram and relevant input and output waveforms, explain the operation of inverting Schmitt trigger circuit using operational amplifier. **(07 Marks)**

c. Explain the operation of Astable multivibrator with relevant waveforms using operational amplifier. **(06 Marks)**

7 a. Explain the following terms:
i) line regulation
ii) load regulation
iii) ripple rejection **(06 Marks)**

b. Explain the operation of integrated circuit voltage regulator with pin diagram and relevant diagram. **(07 Marks)**

c. Calculate the resistances of R_1 and R_2 for the LM217 voltage regulator to produce an output voltage of 9V. Hence design the LM217 regulator circuit by selecting suitable values of input and output capacitors. **(07 Marks)**

8 a. With neat circuit diagram and relevant waveforms, explain the operation of Astable multivibrator using 555 Timer. **(07 Marks)**

b. With neat circuit diagram and relevant waveforms, explain the operation of monostable multivibrator using 555 timer. **(07 Marks)**

c. Write a note on phase locked loop (PLL). Explain the operating principles. **(06 Marks)**

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