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06EE56

Fifth Semester B.E. Degree Examination, June/July 2016
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. *Missing data may be suitably assumed.*
3. *Use of resistor, capacitor standard values list, op-amp data sheets is permitted.*

PART – A

1 a. Explain the working of a high input impedance capacitor coupled voltage follower circuit, with a neat circuit diagram. **(08 Marks)**

b. Design and explain the operation of a single polarity non-inverting amplifier, with a neat sketch. **(08 Marks)**

c. A capacitor coupled inverting amplifier has the following components: $R_1 = 2.7K\Omega$, $R_2 = 100k\Omega$, $R_L = 1.5\ k\Omega$, $c_1 = 3.9\ \mu F$, $c_2 = 0.68\ \mu F$. Determine the circuit voltage gain input impedance, lower cut off frequency and the impedance of c_1 at f_1. **(04 Marks)**

2 a. Explain in detail about the phases lag and phase lead frequency compensation method, analog with the circuit and frequency response curves. **(10 Marks)**

b. Discuss the effect of slew rate on bandwidth and output impedance. **(08 Marks)**

c. Calculate the slew rate limited cutoff frequency for a voltage follower circuit using a 741 op-amp if the peak of sine wave output is to be 5V? **(02 Marks)**

3 a. With a neat circuit diagram, show how a half wave precision rectifier can be combined with a summing circuit to produce a full wave precision rectifier. Draw the voltage wave forms at relevant stages of the circuit and write equations to show that full wave rectification is performed. **(08 Marks)**

b. Explain the operations of an adjustable peak clipper circuit with back – to – back connected zener diodes. **(06 Marks)**

c. Sketch and explain the working of op – amp sample – and hold circuit. **(06 Marks)**

4 a. With a neat circuit diagram and wave forms, explain the operation of inverting Schmitt trigger circuit with different LTP and UTP. **(06 Marks)**

b. Sketch the circuit of an op – amp astable multi – vibrator, show the voltage waveforms at various points in the circuit and explain its operation. **(08 Marks)**

c. Sketch the circuit of capacitor coupled crossing detector. Show the waveforms at various points in the circuit and explain its operation. **(06 Marks)**

PART – B

5 a. Draw the circuit of a triangular/rectangular waveform generator, which has frequency and duty cycle controls. Explain the circuit operation with relevant waveforms for a smaller duty cycle. **(10 Marks)**

b. Using a BIEET op-amp with a supply of ±12 V, design a Wein bridge oscillator to have an output frequency of 15kHz. **(04 Marks)**

c. Draw the circuit of an output stage for controlling the output amplitude and d.c. voltage level of a signal generator. Briefly explain its operation. **(06 Marks)**

6 a. Explain the following terms with a suitable diagram as applied to active filters :
   i) Figure of merit
   ii) Bandwidth
   iii) Centre frequency and
   iv) Narrow band and wide band. **(06 Marks)**

b. Design a second-order high-pass active filter to have a cut-off frequency of 12kHz. Use a 715 op-amp and estimate the highest signal frequency that will be passed. (for 715 op-amp, $I_{B(max)} = 1.5\mu A$ and $f_a = 11MHz$). **(08 Marks)**

c. Explain with a block diagram and response curve, how band stop filter can be obtained using low pass, high pass a summing circuit. **(06 Marks)**

7 a. What is an universal active filter? List the salient features of FLT – U2 specialized IC filter. **(06 Marks)**

b. Explain the theory of operation of a switched capacitor filter. List out the advantages of switched capacitor filter. **(08 Marks)**

c. With a block diagram, explain the operation of a phase locked loop. **(06 Marks)**

8 Write explanatory notes with relevant circuit diagrams and wave forms whenever applicable:

a. Block diagram of a PLL. **(06 Marks)**

b. Power amplifier using general purpose – op – amp. **(06 Marks)**

c. Theory of operation of switched capacitor filer. **(08 Marks)**

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