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06EE56

Fifth Semester B.E. Degree Examination, Dec.09/Jan.10
Linear ICs 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 and capacitor standard value lists is permitted.
3. Missing data may be suitably assumed.

PART – A

1 a. Sketch the circuit of a high Z_{in} capacitor coupled voltage follower. Obtain the expression for input impedance of the circuit. **(08 Marks)**

b. A non-inverting amplifier as in Fig.1(b) has the following components: $R_1 = 33\ K\Omega$, $R_2 = 150\ K\Omega$, $R_3 = 1.5\ K\Omega$, $R_L = 4.7\ K\Omega$, $C_1 = 0.39\ \mu F$, $C_2 = 0.27\ \mu F$. Determine the circuit voltage gain, input impedance and lower cut-off frequency. **(06 Marks)**

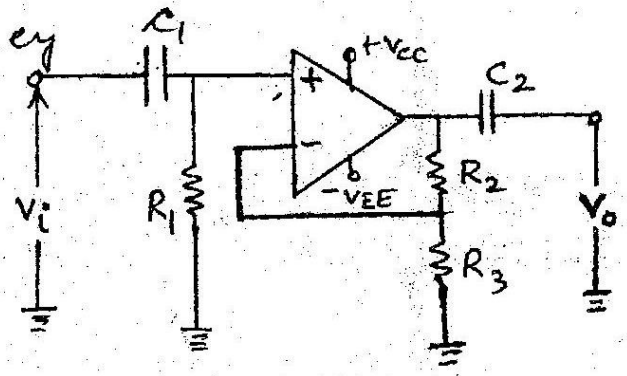

Fig.1(b).

c. Briefly discuss the upper cut-off frequency of an op-amp circuit and show how the cut-off frequency can be set for inverting amplifier. **(06 Marks)**

2 a. Define:
i) Loop gain
ii) Loop phase shift
iii) Unity gain band width. **(06 Marks)**

b. What is frequency compensation? Explain phase lag or phase lead compensation method. **(08 Marks)**

c. List the precautions that should be observed for op-amp circuit stability. **(06 Marks)**

3 a. With a neat circuit diagram, explain the operation of a high input impedance full wave precision rectifier. Draw the voltage waveforms at various points in the circuit and write the appropriate equations to show that full wave rectification is performed. **(08 Marks)**

b. Design an adjustable peak clipping circuit, using an inverting op-amp to clip at approximately ± (3V to 5V). The circuit is to have unity voltage gain before clipping. Choose $I_{Bmax} = 50\ nA$. **(06 Marks)**

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

4 a. Draw the circuit diagram of an inverting Schmitt trigger using op-amp with LTP = 0 and UTP = any value other than zero. Draw the input, output waveforms. Explain clearly the operation. **(06 Marks)**

b. Design a non-inverting Schmitt trigger circuit, to have UTP = 1V and LTP = -1.5V. Use a 741 op-amp with $V_{cc} = \pm 15V$. Choose $I_{Bmax} = 500$ nA. **(08 Marks)**

c. Sketch the circuit of an op-amp astable multivibrator. Show the voltage waveform at various points in the circuit and explain its operation. **(06 Marks)**

PART – B

5 a. Sketch the circuit of a triangular/rectangular waveform generator. Draw the output waveforms from the circuit and explain the circuit operation. **(08 Marks)**

b. State Barkhausen criteria. Explain with a diagram how it is fulfilled in the phase-shift oscillator. **(06 Marks)**

c. Design a Wein-bridge oscillator to have a frequency of 12 KHZ. Use a bipolar op-amp with a ± 15V supply. **(06 Marks)**

6 a. Show how a band pass filter circuit can be constructed by the use of a low – pass filter and a high – pass filter. Sketch the expected frequency response and explain the band pass filter operation. **(08 Marks)**

b. Design a wide-band-reject filter having $f_h = 400$ Hz and $f_L = 2$ HZ having pass gain as 2. **(06 Marks)**

c. Derive expression for gain and phase angle of first-order low-pass Butterworth filter. **(06 Marks)**

7 a. What is dc voltage regulator? Explain the term line regulation, load regulation and ripple rejection for a dc voltage regulator. **(08 Marks)**

b. Sketch the circuit of a voltage follower regulator and explain its operation. **(06 Marks)**

c. Explain the basic circuit of a LM 217 voltage regulator. **(06 Marks)**

8 a. What is phase – locked – loop? Explain the working of building blocks of PLL. **(08 Marks)**

b. Write short notes on:

i) Universal active filter

ii) Switched capacitor filter. **(12 Marks)**

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