USN | | | | | | | | | | 10EE56

Fifth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Linear IC's & Application

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 capacitors standard value lists are permitted.*
3. *Missing data may be suitably assumed.*

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – A

1 a. With a neat circuit diagram, explain the operation of a high input impedance capacitor coupled non-inverting amplifier. Develop the expression for input impedance of the circuit. **(08 Marks)**

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

c. Using a 741 op-amp, design a high Z_{in} non-inverting amplifier to operate with a +36 V power supply, a voltage gain of 100, an output amplitude of 6 V, a lower cut off frequency of 150 Hz, and a minimum load resistance is 12 KΩ. Use a 741 op-amp with maximum input bias current $I_{B(max)}$= 500 nA. **(06 Marks)**

2 a. Sketch typical gain/frequency response and phase/frequency response graphs for an operational amplifier at the high frequency end of the frequency band. Identify the pole frequecncies and rates of fall of voltage gain. Also state the typical phase shift at each pole frequency. Briefly explain. **(08 Marks)**

b. If the maximum amplitude of a sine wave is 5 V, calculate the slew rate–limited cut-off frequency for a voltage follower using op-amp 741. If the unity gain cut-off frequency is 800 kHz, determine the maximum peak value of the sine wave output.
(For 741S=0.5 V/μsec) **(04 Marks)**

c. List the precautions that should be observed for operational amplifier circuit stability, briefly explain each one. **(08 Marks)**

3 a. Show how a dead zone circuit can be combined with a summing circuit to produce precision limiting on the positive half cycle of the output waveform. Draw the voltage waveforms throughout the circuit and explain its operation. **(10 Marks)**

b. A non-saturating precision half wave rectifier using BIPOLAR op-amp with V_{CC} = ±15V is to produce a 2 V peak output. The input signal has a 0.5 V peak amplitude and a frequency of 1 MHz. Calculate the resistor values and specify the diode reverse recovery time. **(05 Marks)**

c. With a neat circuit diagram, explain the working of a voltage follower type peak detector. **(05 Marks)**

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

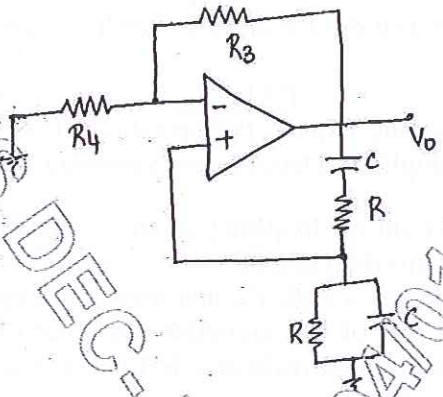
b. Draw the circuit of an op-amp mono stable multivibrator. Show the voltage waveforms throughout the circuit and explain its operation. **(08 Marks)**

c. Using a 741 op-amp with a supply of ±14V, design a inverting Schmitt trigger circuit to have trigger points of ±2 V. **(06 Marks)**

PART – B

5 a. Draw the circuit of a phase shift oscillator. Sketch the output and feedback voltage waveforms and explain the circuit operation. **(06 Marks)**

b. Name the following circuit, determine whether the circuit shown in the Fig.5 (b) will work as an oscillator or not. If yes, determine the frequency of the oscillation. **(04 Marks)**



R = 5.1 KΩ
C = 0.001 μF
R_3 = 6 KΩ
R_4 = 2 KΩ

Fig. Q5 (b)

c. With a neat sketch explain a triangular / rectangular waveform generator, explain how to vary frequency and duty cycle of the output. **(10 Marks)**

6 a. Sketch typical frequency responses for Butterworth and chebyshev second-order active high pass filters. Write the equations required for designing a second order Butterworth high pass filter. **(08 Marks)**

b. Using a 741 op-amp, design a first-order active low pass filter to have a cut-off frequency of 3 kHz. **(06 Marks)**

c. Show how a band-stop filter circuit can be constructed by the use of low pass and high pass filters. Sketch the expected frequency response, and briefly explain. **(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 precision voltage regulator. Explain its operation and discuss how it differs from voltage follower regulator? **(08 Marks)**

c. Calculate the resistances R_1 and R_2 for the LM217 voltage regulator, to produce an output voltage of 9 V. **(04 Marks)**

8 a. With the block diagram, explain the operation of a PLL. **(06 Marks)**

b. List the advantages of the switched capacitor filter. **(04 Marks)**

c. Write short notes on:
(i) Universal active filter.
(ii) IC power amplifier. **(10 Marks)**

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