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Fifth Semester B.E. Degree Examination, Dec.08/Jan.09
Linear IC'S and Applications

Time: 3 hrs.

Max. Marks:100

Note : 1. *Answer any FIVE full questions, selecting minimum of*
Two questions from each part.
2. *Use of resistor and capacitor standard value lists are*
permitted.
3. *Missing data may be suitably assumed.*

PART - A

1 a. Sketch the circuit of a capacitor coupled inverting amplifier using a single polarity power supply. Briefly explain its operation. **(06 Marks)**

   b. Design a capacitor coupled inverting amplifier to operate with a +20V supply. The minimum input signal level is 50mV, the voltage gain is to be 68, the load resistance is 500ohm, the lowest cut off frequency is to be 200 kHz. Use a 741 op-amp with maximum input bias current $I_{B(max)}$ = 5000nA. **(06 Marks)**

   c. With a neat circuit diagram, explain the operation of a high input impedance capacitor coupled voltage follower. Obtain the expression for input impedance of the circuit. **(08 Marks)**

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

   b. With a neat circuit, explain Z_{in} mod method of frequency compensation. Write the equation for the feed back factor. **(06 Marks)**

   c. A particular op-amp with critical frequency (frequency at which $M\beta$ = 1) of 500kHz is used as an inverting amplifier as shown in the Fig. 2(c) with R_f = 120K ohm and R_1 = 10 K ohm. Calculate the stray capacitance which makes the circuit unstable if i) The signal source is open circuited; ii) When R_3 is shorted; iii) When R_3 is present and all the resistors are reduced by a factor of 5. Assume source resistance is of 270 ohm. **(08 Marks)**
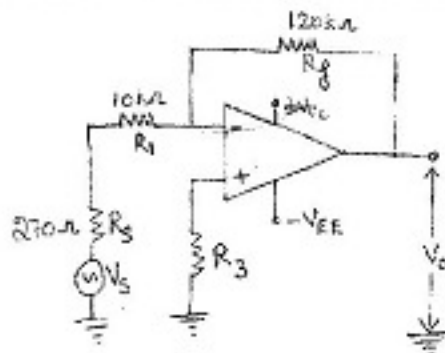

Fig.2(c).

3 a. With a neat circuit diagram, explain the operation of high input impedance full wave precision rectifier. Draw the voltage wave forms at various points in the circuit and write the appropriate equations to show that full wave rectification is performed. **(12 Marks)**

   b. Using a 741 op-amp, design a precision full wave rectifier consisting of a summing circuit and a precision half wave rectifier to produce 1 volt peak output. The input signal has a 1 volt peak amplitude and a frequency of 50kHz. (For 741 op-amp, maximum input bias current is I_B(max) = 500nA, Power supply is ±18V). **(08 Marks)**

4   a. With a neat circuit diagram and waveforms, 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 wave forms at various points in the circuit and explain its operation.

           (06 Marks)

   c. A capacitor coupled zero crossing detector is to handle a 1kHz square wave with a peak to peak amplitude of 6V. Design a suitable circuit using a 741 op-amp with a ± 12V supply. Estimate the minimum op-amp slow rate to give a reasonably undistorted output. Also calculate the lowest sine wave input frequency that can be applied without the phase shift error exceeding $3°$.

           (08 Marks)

PART - B

5   a. State the Bark Hausen criteria and explain how it is fulfilled in the R-C phase shift oscillator. Write the equation for oscillation frequency in a R-C phase shift oscillator.

           (08 Marks)

   b. Draw the circuit of a wein Bridge oscillator. Sketch the output and feed back voltage waveforms and explain the circuit operation.

           (06 Marks)

   c. Using a 741 op-amp design a triangular / rectangular waveform generator to have a output frequency of 1kHz, a triangular output amplitude of ±6V and a square wave output amplitude of approximately ±10V.

           (06 Marks)

6   a. Sketch the circuit of a stage first order band pass filter. Explain the low pass and high pass operation of the circuit.

           (08 Marks)

   b. 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)

   c. Using a 741 op-amp, design a second order low pass filter to have a cutoff frequency of 5kHz.

           (06 Marks)

7   a. Show how a voltage follower regulator should be modified to produce on output voltage greater than the reference voltage. Also show how the output voltage can be made adjustable.

           (08 Marks)

   b. Explain the terms line regulation, load regulation, and ripple rejection for a d.c. voltage regulator.

           (06 Marks)

   c. With a neat circuit diagram, explain the operation of a precision voltage regulator.

           (06 Marks)

8   a. With the block diagram, explain the operation of a phase Locked Loop.

           (06 Marks)

   b. List the advantages of the switched capacitor filter.

           (04 Marks)

   c. Write a short notes on:

     i) Universal active filter.

     ii) LM 217 voltage regulator.

           (10 Marks)