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**Fifth Semester B.E. Degree Examination, July/August 2021**  
**Linear ICs and Applications**

Time: 3 hrs.

Max. Marks: 100

**Note: 1. Answer any FIVE full questions.**

**2. Use of resistor and capacitor standard values list are permitted.**

- 1
  - a. With a neat circuit diagram, explain the operation of high  $Z_{in}$  capacitor-coupled non inverting amplifier and derive the equation for its impedance. (06 Marks)
  - b. Draw the circuit diagram of a capacitor coupled inverting amplifier using a single polarity supply and explain the circuit operation, also write its design steps. (07 Marks)
  - c. Design a capacitor coupled voltage follower using 741 op-amp. The lower cut-off frequency for the circuit is to be 120 Hz and load resistance is 8.2 K $\Omega$ . (07 Marks)
  
- 2
  - a. Define:
 

(i) Loop phase shift	(ii) Loop gain	(iii) Open loop gain
(iv) Closed loop gain	(v) Unity gain bandwidth	(vi) Slew rate

 (06 Marks)
  - b. Discuss the effect of stray capacitance on op-amp circuit stability and explain how to compensate for the effect of stray capacitance. (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 precision clamping circuit and draw input and output waveforms. Write the design steps. (08 Marks)
  - b. Design a non-saturating precision half wave rectifier to produce a 2V peak output from a sine wave input with a peak value of 0.5 V and frequency of 1 MHz. Use a bipolar op-amp with a supply voltage of  $\pm 15V$ . (06 Marks)
  - c. With a neat functional diagram, explain the working of successive approximation type analog to digital converter. (06 Marks)
  
- 4
  - a. With a neat circuit diagram and waveforms, explain the working of inverting Schmitt trigger circuit. Sketch the input-output characteristic and explain its shape. (07 Marks)
  - b. A capacitor-coupled ZCD is to handle a 1 kHz square wave input with a peak to peak amplitude of 6V. Design a suitable circuit using a 741 op-amp with  $\pm 12V$  supply. Assume  $V_B = 0.1V$  and  $\Delta V = 1V$ . (07 Marks)
  - c. With a neat circuit diagram explain the operation of an op-amp astable multivibrator. (06 Marks)
  
- 5
  - a. With a neat circuit diagram and waveforms, explain the operation of triangular/rectangular waveform generator which has frequency and duty cycle controls. (10 Marks)
  - b. Explain the circuit operation of a phase shift oscillator and draw the output and feedback voltage waveforms. (06 Marks)
  - c. Using a BIFET op-amp with a supply of  $\pm 15V$ , design a Wein bridge oscillator to have a output frequency of 12 kHz. Assume  $C = 0.01 \mu F$ . (04 Marks)

- 6 a. Sketch the circuit diagram and frequency response of a first order high pass filter. Explain its operation and design procedure. (06 Marks)
- b. With a neat circuit diagram, explain the operation of a single stage band pass filter, and design procedure. (08 Marks)
- c. With a block diagram, explain the operation of band stop filter constructed using low pass and high pass filters, also draw the frequency response. (06 Marks)
- 7 a. List the various features of universal active filter FLT-U2. (04 Marks)
- b. Explain the operation of switched capacitor filter and draw the input output waveforms. (08 Marks)
- c. With a block diagram, explain the operation of Phase Locked Loop. Write four applications of phase locked loop. (08 Marks)
- 8 a. With a neat circuit diagram, explain the operation of a precision voltage regulator. (06 Marks)
- b. A dc voltage follower regulator has  $V_s = V_{CC} = 12\text{ V}$ ,  $V_0 = 6.3\text{ V}$ ,  $R_1 = 270\ \Omega$  and  $I_{L(\max)} = 42\text{ mA}$ . If the supply source resistance is  $25\ \Omega$ . Determine the line regulation, load regulation and ripple rejection for the circuit. The Zener diode used is 1N753,  $Z_z = 7\ \Omega$ . (06 Marks)
- c. Mention the salient features of 723 regulator. Show how a 723 regulator can be used as a positive and negative voltage regulator and explain the circuit operation. (08 Marks)

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