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10EE56

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 KΩ. **(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 peal value of 0.5 V and frequency of 1 MHz. Use a bipolar op-amp with a supply voltage of ±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 ±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 ±15V, design a Wein bridge oscillator to have a output frequency of 12 kHz. Assume C = 0.01 μF. **(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 $V_S = V_{CC} = 12$ V, $V_0 = 6.3$ V, $R_1 = 270\ \Omega$ and $I_{L(max)} = 42$ mA. If the supply source resistance is 25 Ω. 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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