CBCS SCHEME

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17EC45

Fourth Semester B.E. Degree Examination, July/August 2022
Linear Integrated Circuits

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. With a neat circuit diagram, explain Basic Op-amp circuit. **(08 Marks)**

b. Define CMRR. Derive an expression to relate $V_{i(cm)}$ and $V_{o(cm)}$ voltages of non – inverting amplifier. **(06 Marks)**

c. Explain Input – Offset voltage and Current levels for an Op-amp. Discuss Offset nulling. **(06 Marks)**

OR

2 a. Using an 741 Op – amp, design a non – inverting amplifier to have a voltage gain of 66. The signal amplitude is to be 15mV. **(08 Marks)**

b. Sketch a two input non – inverting summing circuit and derive an equation for the output voltage. **(06 Marks)**

c. With neat circuit diagram, explain Op-amp difference amplifier and explain its operation. Derive the equation for the output voltage. **(06 Marks)**

Module-2

3 a. Sketch the circuit of a high input impedance capacitor coupled voltage follower. Briefly explain the circuit operation. Show its design steps. **(08 Marks)**

b. Using a LF 353 BIFET Op-Amp, design a high Z_{in} capacitor coupled non – inverting amplifier to have a low cutoff frequency of 200Hz. The input and output voltages are to be 15mV and 3V respectively and the minimum load resistance of 12kΩ. **(06 Marks)**

c. Sketch the circuit of a low – resistance voltage source using an Op-amp and a bipolar transistor. Show how a potential divider or a Zener diode may be used to determine the output voltage. Explain. **(06 Marks)**

OR

4 a. With a neat circuit diagram, explain the operation of current amplifier with floating load and derive an equation for load current and hence current gain. **(06 Marks)**

b. Design an instrumentation amplifier to have an overall voltage gain of 900. The input signal amplitude is 15mV, 741 Op-amps are to be used. Power supply of ± 15V, is used. **(08 Marks)**

c. Draw the circuit of a saturating – type of half – wave precision rectifier. Draw the input and output waveforms and explain its operation. **(06 Marks)**

Module-3

5 a. Show how Zener diodes can be used to limit the output voltage of an Op – amp circuit (Peak clipper circuit). Briefly explain **(06 Marks)**

b. Draw an Op – amp Sample – and – hold circuit. Sketch the Signal , Control and Output waveforms. Explain its operation. **(08 Marks)**

c. With neat circuit diagram, explain dc and ac Operation of Op – amp differentiation circuit. **(06 Marks)**

OR

6 a. Sketch the circuit of an Op – amp employed as a non – inverting zero crossing detector and explain. Draw its input and output waveforms. **(04 Marks)**

b. Draw a Op-amp inverting Schmitt trigger circuit. Sketch typical input and output waveforms. Explain the circuit operation and shape of the waveform. **(08 Marks)**

c. With neat circuit diagram, explain the operation of Wein bridge oscillator. Sketch the output and feedback voltage waveforms. **(08 Marks)**

Module-4

7 a. Draw the circuit diagram of a Second – order active low – pass filter and explain its operation. Show its design steps. **(06 Marks)**

b. Design a Second – order high – pass active filter to have a cut off frequency of 12KHz. Use a 715 Op-amp and estimate the highest signal frequency that will be passed. Assume V_i is 70mV. **(06 Marks)**

c. Sketch the circuit of a Single – stage bandpass filter. Explain Low – pass and High – pass Operation of the circuit and briefly discuss the design procedure. **(08 Marks)**

OR

8 a. Show how a bandstop filter circuit can be constructed by the use of low pass and high pass filters and explain. Sketch expected frequency response. **(06 Marks)**

b. Show the standard representation of three – terminal IC voltage regulator and explain the characteristics of three – terminal IC regulators. **(06 Marks)**

c. Explain i) 723 General purpose regulator with use of functional block diagram.
ii) Simple positive Low – voltage (2V to 7V) regulator using 723 regulator with help of relevant diagram. **(08 Marks)**

Module-5

9 a. Draw Basic Functional block diagram of NE/SE 566 VCO [Voltage Controlled Oscillator] and explain in detail. **(10 Marks)**

b. Explain the working of Successive approximation type Analog to Digital Converter (ADC) with the help of relevant diagram. **(10 Marks)**

OR

10 a. With a neat functional block diagram and waveforms, explain the working of Astable multivibrator using 555 timer. Derive the expression for output frequency. **(10 Marks)**

b. Explain the working of 4 bit DAC using R – 2R ladder network with help of neat circuit diagram. **(10 Marks)**

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