CBCS SCHEME

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17EC45

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
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. Define the following terms with respect to op-amp and mention their typical values (i) CMRR (ii) PSRR (iii) Slew Rate (iv) I/P Offset voltages (v) Input bias current **(10 Marks)**

b. Sketch the circuit of an op-amp difference amplifier. Discuss the working common mode nulling capability with necessary circuit modifications and equations. **(10 Marks)**

OR

2 a. With a neat circuit diagram, explain the basic operational amplifier circuit. **(06 Marks)**

b. A non-inverting amplifier is to amplify a 100 mV signal to a level 5V. Using 741 op-amp design a suitable circuit. Also calculate the input and output impedances. **(08 Marks)**

c. With a neat circuit diagram, explain inverting summing amplifier and derive for output voltage and show how it can be converted into averaging circuit. **(06 Marks)**

Module-2

3 a. Sketch the circuit of a High Z_{in} capacitor Coupled Non-inverting amplifier and explain its working with necessary design steps. Show that the input impedance is very high compared to capacitor coupled Non-Inverting amplifier. **(10 Marks)**

b. Design a capacitor coupled Inverting amplifier using op-amp 741 to have a voltage gain of 50 and an output voltage of 2.5 V. The input signal frequency ranges from 10 Hz to 1 kHz with a load resistance of 250 Ω. **(06 Marks)**

c. What are the advantages of precision rectifiers over ordinary rectifiers? **(04 Marks)**

OR

4 a. Draw the circuit of an instrumentation amplifier and explain. Also show the method of nulling common mode outputs and how dc output voltage can be level shifted and list the features of instrumentation amplifier. **(10 Marks)**

b. With a neat sketch, explain the working of a precision voltage source with zener diode and op-amp. **(05 Marks)**

c. Explain how upper cutoff frequency can be set in Non-Inverting and Inverting capacitor coupled circuits. **(05 Marks)**

Module-3

5 a. Draw and explain an op-amp sample and hold circuit with necessary waveforms. **(08 Marks)**

b. Explain the working of Weinbridge oscillator using op-amp with a neat sketch of circuit, waveforms and equations. Design the same to get output frequency of 15 kHz with +/– 12 power supply using IC 741. **(08 Marks)**

c. With a neat circuit diagram, explain a multiplier using op-amp. **(04 Marks)**

OR

6 a. With a neat sketch, explain Inverting Schmitt trigger circuit with necessary waveforms and equations. Also design the same using IC741 op-amp to have UTP = 0V and LTP =– 2V with +/– 12V power supply. **(10 Marks)**

b. Sketch the circuit of fundamental log amplifier. Explain its working and derive for output voltage. What is the drawback of fundamental log amplifier and how it can be eliminated in temperature compensated log amplifier. **(10 Marks)**

Module-4

7 a. Sketch the circuit of second order active high pass filter using bipolor op-amp and explain its working. Design the same for a cutoff frequency of 7 kHz. **(08 Marks)**

b. Show how a bandpass filter can be constructed by the use of lowpass and high pass filters. Draw the circuit of a single stage band pass filter and explain the operation with necessary design equations. **(08 Marks)**

c. List the advantages of active filters over passive filters. **(04 Marks)**

OR

8 a. With a neat diagram, explain the operation of IC 723 as high voltage regulator. Design the same to have V_0 = 12V and I_0 = 2A. **(08 Marks)**

b. Discuss the performance parameters of a three terminal IC regulator can be used as a current source. **(08 Marks)**

c. List the important characteristics of a three terminal IC regulator. **(04 Marks)**

Module-5

9 a. With a neat circuit diagram, explain the working of IC 566 voltage controlled oscillator with necessary waveforms. Also derive for output frequency. **(08 Marks)**

b. With a neat circuit diagram and waveforms explain the working of R-2R network D-A converter and derive the expression for output voltage. **(08 Marks)**

c. What is the output voltage produced by a DAC with output range of 0V to 10V for the given binary input number is (i) 0110 (for 4 bit DAC) (ii) 10111011 (for 8 bit DAC). **(04 Marks)**

OR

10 a. Draw the internal schematic of IC 555, configure it for astable operation and explain with necessary equations and waveforms. **(10 Marks)**

b. Explain the working of successive approximation Analog to Digital Converter (ADC). **(10 Marks)**

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