CBCS SCHEME

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15EC46

# Fourth Semester B.E. Degree Examination, Dec.2023/Jan.2024
## Linear Integrated Circuits

Time: 3 hrs. Max. Marks: 80

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



### Module-1

1 a. Define the following terms as applied to Op-Amp and mention their typical values for IC 741. i) CMRR ii) Slew rate iii) PSRR. **(06 Marks)**

b. With a neat circuit diagram explain the basic Op-Amp circuit. **(06 Marks)**

c. An operational amplifier has a specified input voltage range of ± 8V and an output voltage range of ±14V when the supply voltage is ±15V. Calculate the maximum output voltage that can be produced i) When the Op-Amp is used as a voltage follower ii) When it is used as an amplifier with a voltage gain of 2. **(04 Marks)**

**OR**

2 a. With a neat circuit diagram, explain direct coupled inverting amplifier with design steps, input impedance and output impedance. **(08 Marks)**

b. Derive an output voltage equation of 3 input inverting summing circuit and show how it can be converted into averaging circuit. **(08 Marks)**

### Module-2

3 a. Draw the circuit of a capacitor coupled non-inverting amplifier and explain with necessary design equations. Design a high input impedance capacitor coupled non-inverting amplifier with a gain of 100 and lower cut off frequency of 100 Hz. Assume the load resistance is 2.2 KΩ and input parasitic capacitance as 15 pF. **(10 Marks)**

b. Design a capacitor coupled inverting amplifier for a pass band gain of 100, lower cut off frequency of 120 Hz and upper cutoff frequency to be 5 kHz. Use LF353 BIFET opamp and assume load resistance as 2 KΩ. **(06 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. **(09 Marks)**

b. Design a non-saturating precision half wave rectifier to produce a 2 V peak output from a 1 MHz sine wave input with a 0.5 V peak value. Use a bipolar op-amp with a supply voltage of ±15V. **(07 Marks)**

### Module-3

5 a. With neat circuit diagram and waveforms, explain sample and hold circuit. **(08 Marks)**

b. Explain differentiating circuit operation with neat circuit diagram and design steps. **(08 Marks)**

**OR**

6 a. Using 741 Op-Amp with a supply of ±12V, design a phase shift oscillator to have an output frequency of 3.5KHz. **(06 Marks)**

b. Explain log amplifier and derive its output voltage equation. **(06 Marks)**

c. Using a 741 Op-Amp with supply voltage of ± 12V, design an inverting Schmitt trigger circuit to have trigger points of ± 2V. **(04 Marks)**

## Module-4

7 a. Explain the operation of first order low pass filter with neat circuit diagram, frequency response and design steps. Using a 741 opamp, design a first order active low pass filter to have a cutoff frequency of 2 kHz. **(08 Marks)**

b. Draw the circuit of a single stage band pass filter and explain the operation with necessary design equations. **(08 Marks)**

**OR**

8 a. Draw the standard representation of 78XX series 3-terminal IC regulator and enumerate the characteristics of this type of regulators. Also define the following performance parameters of a voltage regulator. (i) Line regulation (ii) Load regulation (iii) Ripple rejection **(08 Marks)**

b. With a neat diagram, explain the operation of low voltage regulator using IC723. Design a voltage regulator circuit using LM723 to obtain $V_0 = 5$ V and $I_0 = 2$ A. **(08 Marks)**

## Module-5

9 a. Draw the block diagram of PLL and explain its operation, list the application of PLL. **(05 Marks)**

b. Explain the operation of analog to digital conversion using successive approximation technique. **(05 Marks)**

c. Design astable multivibration using 555 timer for the frequency of oscillation 2 kHz with 25% duty cycle. Sketch the circuit after design. **(06 Marks)**



**OR**

10 a. With necessary circuit, explain how PLL can be used as frequency multiplier and divider. **(05 Marks)**

b. Explain how 4-bit digital information converted to analoge using R-2R ladder network DAC. **(05 Marks)**

c. List the specification parameters of ADC and briefly discuss on same (min 4 parameters). **(06 Marks)**

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