

**III B. Tech I Semester Regular/Supplementary Examinations, December – 2023****LINEAR IC APPLICATION**

(Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**

All Questions Carry Equal Marks

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**UNIT-I**

1. a) Explain the following terms in an op-amp: [7M]
  - i) Bias current
  - ii) Thermal drift
- b) What is the principle of switched mode power supplies? Discuss its merits and demerits. [7M]

(OR)

2. a) Sketch an instrumentation amplifier using op-amp and derive its output voltage equation. [7M]
- b) Determine the frequency response characteristics of an operational amplifier. [7M]

**UNIT-II**

3. a) In an op-amp I/V converter circuit,  $V_o$  is 6 V,  $R_f = 470 \text{ k}\Omega$ . Determine the value of short circuit current  $I_{sc}$ . [7M]
- b) Draw the circuit for first-order low pass filter and high pass filter and derive the expressions for cut-off frequencies. [7M]

(OR)

4. a) Derive the op-amp output voltage equation for the following: [7M]
  - (i) Integrator, (ii) Differentiator.
- b) What is a comparator? With a neat diagram explain its characteristics. [7M]

**UNIT-III**

5. a) Determine the component values of 60 dB/decade HPF for  $f_c = 100 \text{ kHz}$ . [7M]
 

Assume  $C_1 = C_2 = C_3 = C = 220 \text{ pF}$  with usual notation.
- b) Given a band pass filter with lower and higher cut-off frequencies of 50 Hz and 60 Hz respectively, find its (i) quality factor, (ii) resonant frequency, and (iii) bandwidth. [7M]

(OR)

6. a) Determine the order of Butterworth low pass filter so that at  $\omega = 1.5 \omega_{3\text{dB}}$  the magnitude response is down by at least 30 dB. [7M]
- b) Design a wideband band pass filter with  $f_L = 200 \text{ Hz}$  and  $f_H = 1 \text{ kHz}$  and calculate the value of Q for the filter. [7M]

**UNIT-IV**

7. a) Draw the 555 Timer circuit in a stable mode and explain the working with the help of waveforms. [7M]
- b) Discuss the application of PLL IC for frequency multiplication. Differentiate between frequency multiplication and frequency translation. [7M]

(OR)

8. a) Design an astable multivibrator to get output wave form at 10 kHz, with a duty cycle of 75% using 555 IC. [7M]
- b) Draw the block diagram of IC 566 VCO and explain its operation. [7M]



**UNIT-V**

9. a) Draw the necessary waveforms and explain the working principle of a dual-slope integrating type ADC. Describe the necessary expression for accumulated counts. [7M]
- b) An analog signal is to be digitally coded with a resolution of 0.01%. The highest significant frequency is 1.6 kHz. The voltage range is 0-8 V. Determine: [7M]
- (i) The minimum sampling rate
- (ii) Minimum number of bits in the digital code.
- (OR)
10. a) Describe the operation of dual slope analog to digital converter with necessary diagrams. [7M]
- b) Explain R-2R ladder-network type digital to analog converter with the help of a circuit. [7M]