

Time: 3 hours

Total Marks: 80

N.B: 1) Question No.1 is compulsory

2) Solve any three from the remaining five.

3) Figures to the right indicate full marks.

Q. 1 Attempt any four sub-questions.

- A. Explain the block diagram of general-purpose op-amp [5]
- B. Draw a neat circuit diagram for voltage to current converter. Derive its output current expression. [5]
- C. With the help of a neat circuit diagram, input / output waveforms and transfer characteristics, explain the working of zero crossing detector (ZCD). [5]
- D. Explain the functional block diagram of Timer IC 555. [5]
- E. Design a 50-mA current source using IC 7805. Assume $R_L = 100 \Omega$ [5]
- F. With the help of a functional block diagram explain the working of Voltage Controlled Oscillator IC 566 [5]

Q. 2 A. Draw the circuit diagram of a closed loop inverting amplifier using op-amp with a voltage gain of -10. If the supply voltage is $\pm 15 \text{ V}$ and input signal applied to the circuit is $v = 0.5 \sin(2\pi 1000t)$ sketch its input and output waveforms. Clearly indicate the peak values of the voltages and time period of the waveforms. [10]

B. Design a practical integrator using op-amp to integrate an input signal where lowest desired frequency of Integration is 1 kHz. (Assume $C_F = 0.01\mu F$) [10]

Q. 3 A. With the help of a circuit diagram, input and output waveforms and voltage transfer characteristics explain the working of a non-inverting Schmitt trigger. Derive the expressions for the Upper & lower threshold levels. [10]

B. Design an astable multivibrator for an output frequency of 5 kHz and duty cycle 75%. (Assume $C_F = 0.01\mu F$) [10]

- Q. 4 A. Draw the circuit of an instrumentation amplifier using three op-amps. [10]
Derive its output voltage equation. What are its advantages over a difference amplifier using single op-amp?
- B. What is a precision rectifier? Write the advantages of precision rectifier [10]
over normal diode rectifier. Explain half wave precision rectifier with the help of a diagram input-output waveforms and transfer characteristics.
- Q. 5 A. Design an adjustable output voltage regulator using IC 317 to give 10 [10]
Volts at $I_L = 150$ mA. Given $I_{ADJ} = 100$ μ A. Choose $R_1 = 240$ Ω
- B. What is the basic principle of Sine Wave oscillators? With the help of a [10]
neat diagram explain the working of R C phase shift oscillator using op amp. Write the expression for its frequency of oscillation. Calculate the values of R & C if its frequency of oscillation is 1 kHz.
- Q. 6 Write short notes on: (Attempt any four)
- A. Closed loop Difference Amplifier using Op-amp [5]
 - B. Practical Differentiator using Op Amp [5]
 - C. Peak detector using Op Amp [5]
 - D. Monostable Multivibrator using IC 555 [5]
 - E. High voltage Low Current Voltage regulator using 723 [5]
 - F. IC 565 Phase Locked Loop (PLL) [5]
