

Time: 3 hours

Total Marks: 80

N.B.:

- 1) Question No.1 is compulsory
- 2) Solve any three from remaining five.
- 3) Figures to right indicate full marks.

Q. 1 Attempt any four questions.

- A) Write short note on Inverting ZCD with input-output waveforms. [5]
- B) Define the following parameters with values of an operational amplifier 741.
 - i) CMRR ii) Virtual Ground iii) Output Offset Voltage
 - iv) Unity Gain Bandwidth v) Slew Rate [5]
- C) Compare Inverting and Non-Inverting comparator. [5]
- D) Write note on grounded load type voltage to current converter. [5]
- E) Explain the functional block diagram of IC 555. [5]

Q. 2 A) Draw the circuit diagram of op-amp based differentiator and derive the expression for output voltage. Enlist the limitations of ideal differentiator and how they are overcome in practical differentiator. [10]

B) Explain the operation of Non-inverting Schmitt Trigger. Draw the input- output waveforms along with transfer characteristics. Find the expression for hysteresis voltage for it. [10]

Q. 3 A) Draw and explain working of RC-phase shift Oscillator and derive the expression for output frequency. [10]

B) What are the advantages of precision rectifiers? Explain in detail Full-wave precision rectifier with neat waveforms and waveforms. [10]

Q. 4 A) Explain the Astable Multivibrator using IC 555. Derive the expression for duty cycle and Output frequency. Draw the waveforms. [10]

B) Design a high pass second order Butterworth filter for the cut off frequency of 1kHz and Passband gain $A_f = 2$. [10]

Q. 5 A) What is an Instrumentation Amplifier. Draw a neat diagram of three-op-amp I. A. Derive its output voltage equation. [10]

B) Design a voltage regulator with $V_o = 10$ Volts and $I_L = 100$ mA. Short circuit Protection is to be provided at $I_L = 150$ mA. Assume V_{Sense} to be 0.65 volts. Use IC LM 723. [10]

Q. 6 Write short notes on: (Attempt any four)

- A) Phase Locked Loop (PLL) [5]
- B) Compare Linear regulators with switching mode regulators [5]
- C) Three Terminal Voltage regulators [5]
- D) Difference amplifier [5]
- E) Positive Peak detector circuit [5]
