**3 Hours**                                            [Total Marks : 80

Note :  1. Question no. 1 is compulsory

2. Attempt any **three** questions from remaining **five** questions

3. Assume suitable data whenever necessary

Q.1.   a. Draw and explain circuit diagram of peak detector.                      20

b. Explain lead compensation in bridge.

c. A bridge circuit has R1 = R2= R3 =2kΩ and R4= 2.05Ω resistances and a 5V supply. If a galvanometer with a 50Ω internal resistance is used for a detector, find the offset current.

d. Explain the significance of all-pass filters.

Q.2.   a. What is the need for 3 op-amp instrumentation amplifier? Mention the applications of instrumentation amplifier. Explain any one in detail.               10

b. Draw and explain circuit diagram of precision rectifier circuit using op-amp. Discuss its advantages over traditional diode rectifier.                          10

Q.3.   a. Draw and explain circuit for ideal differentiator with waveforms. Discuss the problems associated with ideal integrator and draw the circuit diagram for practical differentiator.                                                              10

b. What are the advantages of active filters over passive filters. Design a second-order high pass filter at a high cut-off frequency of 1kHz.                          10

Q. 4.   A CdS cell has a dark resistance of 100kΩ and a resistance in a light beam of 30kΩ.The cell time constant is 72ms. Devise a system to trigger a 3-V comparator within 10ms of the beam interruption.                                         10

b. Draw and explain the principle and construction of metal strain gauges. What is the signal conditioning associated with it.                                         10

Q.5.   a. Explain the following terms :                                          10

(i) Signal level and bias changes

(ii) Filtering and impedance matching

(iii) Linearization

(iv) Concept of loading

b. A sensor outputs a voltage ranging from -2.4 to -1.1V. For interface to an analog-to-digital converter, this needs to be 0 to 2.5V. Develop the required signal conditioning.                                                              10

**[TURN OVER]**

Q.6.   Write short notes on : (any four)                                        20

      a.   Sample and hold circuit

      b.   Phase Locked loop

      c.   IC 555 timer

      d.   Data Acquisition System

      e.   A to D converters

      f.   SMPS

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