Q. P. Code : 38425

Note: 1. Question no. 1 is compulsory

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

3. Figures to the right indicate full marks

4. Assume suitable data whenever necessary

Duration: 03 hours   Marks: 80

Q.1. a. Explain the terms Signal level and bias changes, filtering and impedance matching.

b. Draw and explain circuit diagram of zero crossing detector.   20

b. Explain the characteristics of digital data.

c. Design a high-impedance amplifier with a voltage gain of 42.

d. The resistors in a bridge are given by $R_1 = R_2 = R_3 = 120\Omega$ and $R_4 = 121\Omega$. If the supply is 10.0V, find the voltage offset.

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

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

b. Draw and explain circuit diagram of absolute value circuit using op-amp and sketch the input and output waveforms. Discuss its advantages over traditional diode rectifier.   10

Q. 4. A sensor resistance changes linearly from 100 to 180Ω as temperature changes from $20°$ to $120°C$. Find a linear equation relating resistance and temperature.   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. Design and explain operation of Astable multivibrator using IC555.   10

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

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

a. Sample and hold circuit   b. PLL   c. Voltage regulator IC 723

d. Data Acquisition System   e. SMPS   f. Weighted resistor DAC

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