Q.P. Code : 597600

Signal Conditioning Circuit Design

3 Hours [Total Marks : 80

(1) Question no. 1 is compulsory.
(2) Attempt any three questions from remaining five questions.
(3) Assume suitable data wherever necessary.

Q.1. (a) Explain the significance of all pass filter. 20

(b) Draw and explain zero crossing detector circuit.

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

(d) Explain the terms:

    (i)   Signal Level and Bias changes
    (ii)   Filtering and impedance matching

Q.2. (a) Draw and explain circuit diagram of absolute value circuit using op-amp. 10

Discuss its advantages over traditional diode rectifier.

(b) What is a multivibrator? Design astable square wave generator using IC 555 and determine timing components for frequency of 10 kHz. 10

Q.3. (a) List the applications of instrumentation amplifier. Explain any one in detail. 10

(b) Discuss problems associated with ideal integrator. Draw the circuit for practical integrator. Determine the output voltage for an input step (dc) voltage of 2V and $R_iC_f = 1$ second. Assume that the op amp is initially nulled. Sketch the input and output waveform. 10

Q.4. (a) 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

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

Q.5. (a) Draw and explain the principal and construction of metal strain gauges. What is the signal conditioning associated with it? 10

(b) A strain gauge with GF = 2.03 and R = 350Ω is used in the bridge. The bridge resistors are $R_1 = R_2 = 350\Omega$ and the dummy gauge has R = 350 Ω. If a tensile strain of 1450μm/m is applied, first the bridge offset voltage if $V_s = 10.0$V. Find the relation between bridge off-null voltage and strain. How much voltage results from strain of 1micro? 10

[TURN OVER]

Q.6.   Write short notes on any four of the following.   20

    (a) SMPS

    (b) Data acquisition system

    (c) Sample and hold circuit

    (d) PLL

    (e) Dual Slope A to D converter

    (f) V to F converter

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