INS / em V / Signal Conditioning Circuit Design / 25-05-15

QP Code : 3335

Duration : 03 Hours **Total Marks : 80**

Note: 1) Question **No. 1** is **compulsory.**
2) Answer any **three questions** from the remaining **five questions.**
3) Assume **suitable data** wherever **necessary.**

1. Answer the following: **20**
   a) What are precision rectifiers? How are they superior to traditional rectifiers.
   b) Briefly explain the concept of Loading with example.
   c) Explain V-F convertor.
   d) What are the four characteristics of three terminal IC regulators.

2. a) Explain Dual slope Analog-to-Digital Convertor with diagram and waveform. **10**
   b) Explain operation of Astable Multivibrator using IC 555 with a neat circuit diagram and waveforms. **10**

3. a) Explain the construction and working of 3-opamp Instrumentation amplifier. Give any one of its applications in detail. **10**
   b) What the advantages of Active filters. Design a second order High Pass Butterworth filter with a cut-off frequency of 2 KHz. **10**

4. a) A CdS cell has a dark resistance of 100 kΩ and a resistance in a light beam of 30 kΩ. The cell time constant is 72 ms. Devise a system to trigger a 3-V comparator within 10 ms of the beam interruption. **10**
   b) Explain Optical encoder signal conditioning for linear displacement and linear velocity applications with suitable diagram. **10**

5. a) An RTD has $\alpha_o = 0.005$ /°C; R = 500 Ω and Dissipation constant of $P_D = 30$ mW/°C at 20° C. The RTD is used in a bridge circuit with $R_1 = R_2 = 500$ Ω and R_3 is a variable resistor used to null the bridge. If supply voltage is 10 V and RTD is placed in bath at 0° C, find the value of R_3 to null the bridge. **12**
   b) A Solid-state pressure sensor that outputs 25 mV/kPa for a pressure variation of 0.0 to 25 kPa will be used to measure the level of a liquid with a density of $1.3*10^3$ kg/m^3. What voltage output will be expected for level variations from 0 to 2.0 m? What is the sensitivity for level measurement expressed in mV/cm? **08**

6. Write short notes on : **20**
   a) Sample and Hold circuit
   b) Phase Locked Loops
   c) Power supply design using 78xx
   d) SMPS
