COURSE CODE (CREDITS): 21M11EC111 (3)   MAX. MARKS: 15

COURSE NAME: SENSOR AND SMART INSTRUMENTATION

COURSE INSTRUCTOR(S): Dr. HARSH SOHAL   MAX. TIME: 1 Hour

Note: All questions are compulsory. Marks are indicated against each question in square brackets.

Q1. [CO1]Define and explain the following terms (in reference to measurement systems) with suitable examples. [3]

  (a) Sensitivity (b) Resolution (c) Precision

(b) A 0-200 V voltmeter has a guaranteed accuracy of 1 per cent full-scale reading. The voltage measured by this meter is 90 V. Calculate the limiting error in percentage. [2]

Q2. [CO1, CO2] (a) Why should we avoid a measuring technique which involves subtraction of experimental results (quantities)? Explain with an example. [2]

(b) Calculate the voltage drop (up to correct significant figures); if a current of 3.18 A is recorded in a resistance of 35.68 Ω. [1]

(c) One junction of an iron-copper thermocouple is maintained at 110 °C and the other at 10 °C. Calculate the thermo emf generated. The thermoelectric constants are given as:

x1=20.42μV C^{-1} and x2= -0.019μV C^{-2} [2]

Q3. [CO2] (a) What are gross errors? Explain with example(s). [1]

(b) A voltmeter, having a sensitivity of 2000 Ω/V, reads 100 V on its 200-V scale when connected across an unknown resistor in series with a milli Ammeter. When milli Ammeter reads 5 mA, calculate

 i. The *apparent* resistance of the unknown resistor; [1]
 ii. The *actual* resistance of the unknown resistor; [1]
 iii. The *error* (in percentage) due to the loading effect of the voltmeter. [2]
   Also draw circuit diagram(s).