Registration No. : | | | | | | | | | | |

Total number of printed pages – 2

B. Tech

PCEI 4302

Fifth Semester Examination – 2013

INSTRUMENTATION AND SYSTEMS – I

BRANCH : EIE, IEE, AEIE, ICE

QUESTION CODE : C-376

Full Marks – 70

Time : 3 Hours

*Answer Question No. **1** which is compulsory and any **five** from the rest.*
The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10

   (a) What is meant by "Systematic Characteristics" ?

   (b) Why the Error Probability Density Function is Gaussian ?

   (c) Distinguish between Repeatability, Reproducibility and Reliability.

   (d) Comment on the parameters used for describing a Second Order system.

   (e) What is the resolution of a 50 turn potentiometer ?

   (f) Why Phase Sensitive Demodulator is used in LVDT ?

   (g) The relationship between applied pressure and central deflection of a circular diaphragm is in general non-linear. How this non-linearity can be minimized ?

   (h) What is the purpose of using Signal Conditioning element in Instrumentation system ?

   (i) Write characteristics of a non-ideal operation amplifier.

   (j) Draw circuit diagram of an instrumentation amplifier and write the expression of the output voltage.

2. (a) Justify the following statement. "Statistical variations amongst a batch of similar elements is called Tolerance". 5

P.T.O.

(b) What is Calibration ? What is a Standard ? What are the SI units ? Comment on any one SI unit. 5

3. (a) Derive Transfer Function of a Mass-Spring-Damper model of Elastic Force sensor. 5

(b) Derive Step Response of a Second order system operating under various damping conditions. 5

4. (a) Derive an expression of the Gauge Factor of a Strain Gauge. How Strain gauge can be used for measurement of Pressure and Force ? 5

(b) Derive an expression of change in capacitive sensing element based on variable separation between the plates. Comment on linearity of the sensor. 5

5. (a) Briefly describe installation problems and Cold Junction Compensation of a Thermocouple. 5

(b) Draw schematic diagrams of elastic sensing elements used for measurement of Pressure, Force and Torque. 5

6. (a) Derive an expression of the out of balance voltage of a Wheatstone bridge operating at unbalanced condition. 5

(b) How Push-Pull configuration improves linearity and sensitivity of a non-linear instrument. 5

7. (a) Derive expressions of the output voltages of the following circuits : 5

(i) Inverting amplifier

(ii) Differential amplifier.

(b) Explain operation of Phase Sensitive demodulator circuit and describe its applications in instrumentation. 5

8. Answer any **two** of the following : 5×2

(a) Dynamic Error in measurement system

(b) I.C. Temperature sensor

(c) A.C. Carrier system.
