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

Total number of printed pages – 2

B. Tech

PCEI 4302

Fifth Semester Back Examination – 2014

INSTRUMENTATION DEVICES AND SYSTEMS - I

BRANCH (S) : AEIE, EIE, IEE

QUESTION CODE : L 248

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) List various statistical characteristics of a instrumentation system.

   (b) What is calibration ?

   (c) Distinguish between static and dynamic characteristics.

   (d) What is Transfer Function ?

   (e) Define gauge factor of a strain gauge.

   (f) Write laws of Thermocouple.

   (g) What are the advantages of using IC temperature sensor ?

   (h) Write the purpose of using signal conditioning circuits in biomedical instrumentation.

   (i) Write important characteristics of operational amplifier.

   (j) Draw circuit diagram of an Instrumentation Amplifier.

2. (a) Define the following terms (i) Accuracy, (ii) Precision, (iii) Linearity, (iv) Range, (v) Span. 5

   (b) Briefly describe the roles of various elements of a general measurement system. 5

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3. (a) Derive the step response of a 1st order instrument. 5

(b) Briefly describe the responses of a 2nd order system operating under over-damped, critically-damped and under-damped conditions when excited by a step input. 5

4. (a) Write the basic principle of temperature measurement using RTD and Thermistor. 5

(b) With suitable diagram explain principle of operation of capacitive sensing element. 5

5. (a) Describe construction and principle of operation of LVDT. 5

(b) Describe principle of operation of bourdon tube, bellows and diaphragm for measurement of pressure. 5

6. (a) Derive an expression of the out of balance voltage of a Wheatstone bridge employed for measurement of strain using one active strain gauge. 5

(b) Draw circuit diagram of inverting and differential amplifier. Write the expressions of the output voltages of these circuits. 5

7. (a) Describe the operation of AC carrier system in instrumentation system. 5

(b) Briefly describe the operation of phase sensitive demodulator and its application in instrumentation. 5

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

(a) Define (i) Damping ratio, (ii) Natural frequency of oscillation.

(b) Write the laws of thermocouple.

(c) What are the advantages of using IC temperature sensor.