Reg. No. : | | | | | | | | | | |

Question Paper Code: 51533

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2016

Third Semester

Electronics and Instrumentation Engineering

15UE1303 - SENSORS AND TRANSDUCERS

(Common to Instrumentation and Control Engineering)

(Regulation 2015)

Duration: Three hours | Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Systematic errors are

   (a) Instrumental error
   (b) Environmental error
   (c) Observational errors
   (d) All of the above

2. One of the following is an active transducer

   (a) Starin gauge
   (b) Selsyn
   (c) Photovoltaic cell
   (d) Photo-emissive cell

3. In measurement system which of the following static characteristics are desirable

   (a) Accuracy
   (b) Sensitivity
   (c) Reproducibility
   (d) All of the above

4. The following are the desirable dynamic characteristic of a measurement system:

   (a) Fast response, fidelity, measuring lag and dynamic error
   (b) Fidelity and measuring lag
   (c) Fast response and measuring lag
   (d) Fast response and fidelity

5. The principle of operation of LVDT is based on the variation of

(a) Self Inductance (b) Mutual Inductance
(c) Reluctance (d) Permanence

6. Thermocouples are

(a) Passive transducers (b) Active transducers
(c) Both active and passive transducers (d) Output transducers

7. Piezo-electric transducer work when we apply _____ to it

(a) Mechanical force (b) Vibrations (c) Illuminations (d) Heat

8. Fiber optic transducer can be used to measure

(a) Displacement (b) Power (c) Current (d) Resistance

9. Vibration is commonly expressed in

(a) Hertz (b) Volt (c) Ampere (d) Ohm

10. Humidity can be measured using

(a) Rotameter (b) Hygrometer (c) Thermometer (d) Anemometer

PART - B (5 x 2 = 10 Marks)

11. Define unit.

12. Give the mathematical equation of second order system.

13. Mention two advantages of thermistors over resistance thermometers.

14. Write the applications of Hall effect transducer.

15. What is a smart sensor?

PART - C (5 x 16 = 80 Marks)

16. (a) Explain in detail the various classifications of errors with examples and also discuss the methods of minimizing the errors. (16)

Or

(b) Ten measurements of the resistance of a resistor gave 101.2 Ω, 101.7 Ω, 101.3 Ω, 101.0 Ω, 101.5 Ω, 101.3 Ω, 101.2 Ω, 101.4 Ω, 101.3 Ω, and 101.1 Ω. Assume that only random errors are present. Calculate

(i) the arithmetic mean

(ii) the standard deviation of the readings

(iii) the probable error (16)

17. (a) Discuss in detail about the static characteristics of transducers with suitable sketches. (16)

Or

(b) Derive an equation for time response of a first order system when subjected to unit step input. Draw the response curves and find the dynamic errors. (16)

18. (a) Describe the construction of different types of strain gauges and working principle. (16)

Or

(b) Write a note on

(i) RTD (ii) Capacitor Microphone. (16)

19. (a) Explain the principle of operation, construction, equivalent circuit and application of piezoelectric transducer. (16)

Or

(b) Brief explain the operation of Hall-effect transducer. Also explain its advantages and applications. (16)

20. (a) Explain in detail about the measurement of relative motion and absolute motion using seismic instruments. (16)

Or

(b) Write short notes on:

(i) Smart sensor (8)

(ii) NANO sensor (8)