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

Question Paper Code: 43603

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2019

Third Semester

Instrumentation and Control Engineering

14UIC303-SENSORS AND TRANSDUCERS

(Common to Electronics and Instrumentation Engineering)

(Regulation 2014)

Duration: Threehours Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 1 = 10 Marks)

1. Systematic errors are

   (a) environmental errors (b) observational error
   (c) instrument errors (d) all of the above

2. Self generating type transducers are _____ transducers.

   (a) Active (b) Passive (c) Secondary (d) Inverse

3. Which one is an ability to detect changes in the measured quantity?

   (a) linearity (b) sensitivity (c) precision (d) accuracy

4. The desirable static characteristic of a measuring system are

   (a) Accuracy and reproducibility (b) Accuracy, sensitivity and reproducibility
   (c) Drift and dead zone (d) Static error

5. Material used for the temperature range of operation (160-400)°C

   (a) platinum (b) copper (c) tungsten (d)nickel

6. Capacitive transducers are normally employed for_____ measurements

(a) Static (b) Dynamic (c) Transient (d) Both static and dynamic

7. Quartz and Rochelle salt belongs to _____ of piezo-electric materials

(a) Natural group (b) Synthetic group
(c) Natural or Synthetic group (d) Fiber group

8. Fiber optic sensor can be used to sense _____

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

9. An inverse transducer is a device which converts

(a) electrical energy into thermal energy
(b) electrical energy into light energy
(c) electrical quantity into mechanical quantity
(d) an electrical quantity into a non-electrical quantity

10. Humidity sensor employed for determination of

(a) Relative Humidity (b) Bourdon tube
(c) Temperature (d) Nuclear radiation

PART - B (5 x 2 = 10 Marks)

11. Define Probable Error.

12. List the dynamic characteristics.

13. State the principle of capacitive transducer.

14. Define: Inverse Piezo Electric Effect.

15. What is a smart sensor?

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PART - C (5 x 16 = 80 Marks)

16. (a) (i) Discuss the classification of standards. (8)

(ii) Discuss:

(1) Systematic error (4)

(2) Random error (4)

Or

(b) (i) A test temperature is measured 100 times with variations in apparatus and procedures. After applying the corrections, the readings are:

Temperature ^{0}C	397	398	399	400	401	402	403	404	405
Frequency of occurrence	1	3	12	23	37	16	4	2	2

Calculate: Arithmetic mean, mean deviation, standard deviation, probable error of one reading, probable error of the mean, standard deviation of the mean, standard deviation of the standard deviation. (10)

(ii) Discuss the various classifications of transducers with examples. (6)

17. (a) (i) Discuss the following static characteristics of a transducer. Resolution, Linearity, Hysteresis and Dead zone. (8)

(ii) With a neat diagram, derive the expression for the generalized transfer function of a second order transducer. (8)

Or

(b) Obtain the equation for time response of first order system when subjected to

(i) Unit step input (8)

(ii) Unit ramp input and draw the response curves. (8)

18. (a) Explain in brief about semiconductor strain gauges. (16)

Or

(b) Describe the construction, working, characteristics and uses of LVDT. (16)

19. (a) (i) Elaborate about piezo electric materials and piezo electric co-efficients in detail. (8)

(ii) How does fibre optic transducer work? Brief it. (8)

Or

(b) With neat sketches, extend your thoughts on the constructional details and operation of the following transducers.

(i) Fiber optic transducer (8)

(ii) SQUID sensor (8)

20. (a) State the construction, principle of operation of vibration Instrument for vibration measurement. (16)

Or

(b) (i) Draw the architecture of MEMS sensor and explain its functioning. (8)

(ii) Write short notes on any one IC temperature sensor. (8)

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