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**Question Paper Code: 43603**

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2018

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)

- Strain gauge, LVDT and thermocouple are examples of
  - Active transducers
  - Passive transducers
  - Analog transducers
  - Primary transducers
- Two capacitances,  $C_1 = (150 \pm 2.4) \mu F$  and  $C_2 = (120 \pm 1.5) \mu F$ , are in parallel. What is the limiting error of the resultant capacitance  $C$ ?
  - $0.9 \mu F$
  - $1.9 \mu F$
  - $3.9 \mu F$
  - $4.8 \mu F$
- Which one is an ability to detect changes in the measured quantity?
  - linearity
  - sensitivity
  - precision
  - accuracy
- The desirable static characteristic of a measuring system are
  - Accuracy and reproducibility
  - Accuracy, sensitivity and reproducibility
  - Drift and dead zone
  - Static error
- Material used for the temperature range of operation (160-400) $^{\circ}C$ 
  - platinum
  - copper
  - tungsten
  - nickel

6. Capacitive transducers are normally employed for\_\_\_\_\_ measurements  
 (a) Static                    (b) Dynamic                    (c) Transient                    (d) Both static and dynamic
7. A Hall element can be used to transducer magnetic flux into  
 (a) voltage                    (b) current                    (c) vibration                    (d) none of these
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. Which of the following can be measured with the help of piezo electric crystal?  
 (a) Sound                    (b) Velocity                    (c) Force                    (d) Pressure

PART - B (5 x 2 = 10 Marks)

11. What is unit? What are its types?
12. List the dynamic characteristics.
13. State the principle of capacitive transducer.
14. List the various factors affecting the propagation of light through optical sensors.
15. Define the term 'Relative humidity'.

PART - C (5 x 16 = 80 Marks)

16. (a) (i) Discuss the classification of standards. (8)  
 (ii) How will you classify errors? Explain them in brief. (8)

Or

- (b) (i) Discuss the classification of standards. (8)  
 (ii) Discuss:  
       (1) Systematic error (4)  
       (2) Random error (4)

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) With an example of a first order transducer, determine its step and frequency response characteristics. (16)

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

Or

(b) Write a note on

(i) RTD (8)

(ii) Thermistors. (8)

19. (a) Define piezo-electric effect. Explain how a piezo-electric crystal is used for the measurement of force with necessary derivations. (16)

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) With neat sketches and expressions, illustrate the constructional details and operation of seismic accelerometer. (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)

