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Question Paper Code : 51528

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Fourth Semester

Electronics and Instrumentation Engineering

EI 2252/EI 42/EI 1252/080300010/10133 EI 403 – TRANSDUCER ENGINEERING

(Common to Instrumentation and Control Engineering)

(Regulations 2008/2010)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. Write the need for calibration.
2. What are active and passive transducers ?
3. Define “resolution” of an instrument.
4. An instruments transfer function is given by $G(S) = \frac{4}{s^2 + s + 4}$. Find the damping ratio and natural frequency of the system.
5. Why dummy strain gauges are used in a measurement application which uses strain gauges ? What will happen if it is not used ?
6. What is piezo resistive effect ?
7. What is an El Pick up ?
8. How a capacitive transducer is used as pressure sensor ?
9. Give any two examples for MEMS sensors.
10. Write the principle of Piezo-electric transducer.

PART – B (5 × 16 = 80 marks)

11. (a) (i) Discuss the causes and methods to minimize different types of errors. (10)
(ii) Write short notes on classification of standards. (6)

OR

- (b) (i) Write short notes on significance of odds and uncertainty in measurement. (8)
(ii) The marks obtained by 10 students out of 100 is shown in Table 11(b) (ii). (8)

10	99	8	23	62	86	90	85	51	39
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Determine, the mean and standard deviation.

12. (a) (i) Discuss about the dynamic characteristics of transducers. (8)
(ii) Derive the time response of a first order transducer for a unit ramp input. Draw the response and discuss about the steady state error. (8)

OR

- (b) (i) For a first order instrument system, with a governing equation :
 $(1 + \tau D) V_0(t) = K\theta_i(t)$, D being $\frac{d}{dt}$, with input $\theta_i(t)$ being a unit step input, derive the expression for $V_0(t)$. Draw the shape of the response. (8)
(ii) Discuss the static characteristics accuracy, precision and sensitivity with examples. (8)

13. (a) Describe the construction of different types of strain gauge and working principle.

OR

- (b) (i) Explain the principle of operation and construction of hot wire anemometer. (8)
(ii) Describe the procedure for measuring humidity using hair hygrometer. (8)

14. (a) Explain the measurement of liquid level in a tank using capacitive transducer. Explain the method used for overcoming the nonlinear relation between the output capacitance and the applied input linear displacement, in a variable separation displacement type capacitive sensor. (16)

OR

- (b) Describe the measurement of displacement using LVDT. Also explain the required signal conditioning. (16)

15. (a) (i) Describe the principle of operation of Hall Effect sensor. What are the applications? (8)
(ii) Describe the role of MEMS in Instrumentation. (8)

OR

- (b) Briefly Discuss the working and principle the following sensor
(i) Fibre Optic Sensor (8)
(ii) SQUID sensor. (8)