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Question Paper Code : 91466

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014.

Fourth Semester

Electronics and Instrumentation Engineering

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

(Common to Instrumentation and Control Engineering)

(Regulation 2008/2010)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are fractional errors?
2. What are the drawbacks of CGS system of units?
3. Define resolution of a transducer.
4. What is the difference between accuracy and precision in an instrument?
5. What is a potentiometer?
6. A resistance wire strain gauge with a gauge factor of 2 is bonded to a steel structural member subjected to a stress of 100 MN/m². The modulus of elasticity of steel is 200 GN/m². Calculate the percentage change in the value of gauge resistance due to the applied stress. Comment upon the result.
7. What are the advantages of differential output?
8. What for capacitive transducers are used?
9. A quartz piezo-electric crystal having a thickness of 2 mm and voltage sensitivity of 0.055 Vm/N is subjected to a pressure of 1.5 MN/M². Calculate the voltage output. If the permittivity of quartz is 40.6×10^{-12} F/m, calculate the charge sensitivity.
10. What is a hall effect transducer?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Discuss in detail about instrumental errors. (10)
- (ii) Three $250\ \Omega$, $500\ \Omega$ and $375\ \Omega$ resistors are connected in parallel. The $250\ \Omega$ resistor has a + 0.025 fractional error, the $500\ \Omega$ resistor has a -0.036 fractional error and $375\ \Omega$ resistor has a + 0.014 fractional error. Determine
- (1) The total resistance neglecting errors
 - (2) Total resistance considering the error of each resistor and
 - (3) The fractional error of the total resistance based upon the rated values. (6)

Or

- (b) (i) Explain the following :
- (1) Arithmetic mean
 - (2) Dispersion
 - (3) Average deviation
 - (4) Standard deviation
 - (5) Variance. (10)
- (ii) How do you classify the transducers? (6)
12. (a) (i) Describe briefly about the dynamic characteristics of transducers. (8)
- (ii) Obtain the mathematical model of a transducer. (8)

Or

- (b) (i) Discuss about zero, I and II order transducers in detail. (8)
- (ii) Obtain the step response of I order system and explain the effect of different time constants on the response of the system. (8)
13. (a) Describe about different types of strain gauges. (16)

Or

- (b) (i) What is a resistance thermometer? Mention the requirements of the conductor material to be used in thermometers? What do you mean by linear and quadratic approximation? (8)
- (ii) Explain the construction and working principle of resistive potentiometer. (8)

14. (a) (i) Mention three types of variable inductance transducers. Explain the working on the principle of change in self inductance. (10)
(ii) Write the advantages of LVDTs. (6)

Or

- (b) (i) Describe the methods by which capacitive transducers are used for the measurement of linear displacement (10)
(ii) Write short notes on capacitor microphone. (6)
15. (a) (i) Discuss about different types of photo detectors. (8)
(ii) Explain the principle of piezo-electric transducers. (8)

Or

- (b) Write short notes on the following :
(i) Digital transducers (8)
(ii) SQUID sensors. (8)
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