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Question Paper Code : 23449

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

Fourth Semester

Electronics and Instrumentation Engineering

EI 1252 /EI 1301/070300006 — TRANSDUCER ENGINEERING

(Common to Instrumentation and Control Engineering)

(Regulation 2004/2007)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are Active and Passive transducers?
2. Distinguish between Static and Dynamic characteristics.
3. What is bias in an instrument?
4. Give an example of first order transducer.
5. What is meant by negative temperature coefficient of resistance?
6. What is piezoelectric effect?
7. Write the expression for the frequency response of a capacitive transducer.
8. What is meant by residual voltage in LVDT?
9. What is a Charge Amplifier?
10. Mention two applications of IC sensor.

PART B — (5 × 16 = 80 marks)

11. (a) (i) The current passing through a resistor of $300\Omega \pm 0.2\Omega$ is $4 \pm 0.02A$. Using the relationship for power dissipation calculate the limiting error in the computed power dissipation. (8)

(ii) A set of ten independent measurements were made to determine the output voltage of a thermocouple. The value of the readings in (mV) is 4.213, 4.221, 4.218, 4.220, 4.019, 4.246, 4.267, 4.287, 4.290, 4.230. Determine (1) Arithmetic mean (2) Average deviation (3) Standard deviation (4) Variance. (8)

Or

(b) (i) Discuss in detail the different types of errors in measurement system. (10)

(ii) What are Odds and Uncertainties in measurement? (6)

12. (a) (i) Explain the static characteristics of measurement system. (6)

(ii) What is loading effect of shunt connected instrument? (4)

(iii) A multimeter having sensitivity of 2000 ohms/V is used to measure the voltage across a circuit having an output resistance of 10 K. The open circuit voltage of the circuit is 6 V. Find the reading of the multimeter when it is set to 10 V scale. Find the percentage error. (6)

Or

(b) (i) Derive an expression for the output of a first-order instrument when subjected to unit impulse input. Also sketch the response. (8)

(ii) The gas pressure inside a vessel starts increasing from the initial value of 100 kPa at the rate of 2000 Pa/sec. The pressure is measured by a second-order instrument with a damping ratio of 0.7 and a natural frequency of 30 Hz. Sketch the input and output variation with time and find the steady-state error in instrument reading after transient in output has vanished. (8)

13. (a) (i) Describe the construction and the working of Resistance Potentiometers. (6)

(ii) Derive an expression for the error occurring in a resistance potentiometer when connected across a load of finite resistance. Also obtain the condition for maximum error. (10)

Or

(b) (i) Derive an expression for "Gauge Factor" of a Strain Gauge. (6)

(ii) Describe the construction and working of Constant Current Type and Constant Temperature Type Anemometers. (10)

14. (a) (i) With a neat sketch explain the construction and working of LVDT. (8)

(ii) What are the advantages and disadvantages of LVDT? What are the applications of LVDT? (8)

Or

(b) (i) Explain the principle of operation of a capacitive transducer. (8)

(ii) Derive the expression for the out put voltage of a differential arrangement for the capacitive displacement transducer. (8)

15. (a) Explain the working of a accelerometer using piezoelectric crystal. Explain how the charge amplifier is useful in this measurement. (16)

Or

(b) Write short notes on:

(i) Smart sensors (8)

(ii) Fibre optic transducer. (8)
