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(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 0325 Roll No.

B.Tech.

(SEMESTER-IV) THEORY EXAMINATION, 2011-12

TRANSDUCER AND SENSORS

Time : 3 Hours] *[Total Marks : 100*

Section – A

1. Attempt **all** question parts : **10 × 2 = 20**

   (a) What are active and passive transducers ?

   (b) Define threshold and resolution of the instrument.

   (c) Give any four transducer applications of displacement measurement.

   (d) Specify any two methods used by tachometer encoders in speed measurements.

   (e) Draw an idealized model of an elastic force transducer.

   (f) Name four forms of manometer.

   (g) Give the operating principle of an ultrasonic flowmeter.

   (h) What are the two basic forms of Hot-wire anemometers ?

   (i) What are total immersion and partial immersion thermometers ?

   (j) What are the two major categories of infrared detectors ?

Section – B

2. Attempt any **three** question parts : **3 × 10 = 30**

   (a) (i) Explain the functional elements of an instrument system with the help of suitable block diagram.

   (ii) Explain the method of high-gain feedback of correction for interfering and modifying inputs.

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(b) Explain with the help of diagrams variable-inductance and variable-reluctance pickups.

(c) Enlist the various means of measuring an unknown force. Illustrate the basic analytical balance force-measurement method.

(d) Explain the operation, with the help of diagram of flow nozzle, venturi tube and Dall flow tube.

(e) Explain the working principle of bimetallic thermometers. What are the various configurations of bimetallic sensors developed to meet various application requirements ?

Section – C

Attempt **all** questions. $5 \times 10 = 50$

3. Attempt any **two** parts. $2 \times 5 = 10$

(a) Consider a pressure-type thermometer to explain the concepts of an instrument or a measurement system.

(b) What is independent linearity ? Explain linearity specification.

(c) Explain the various hysteresis effects for instruments.

4. Attempt any **one** part : $1 \times 10 = 10$

(a) Write the several different ways of implementing the basic principle of the resistance strain gage. Explain the weldable strain gage.

(b) What are digital transducers ? What are the three major classes of digital transducers ? Explain translational and rotary encoders.

5. Attempt any **one** part : $1 \times 10 = 10$

(a) Explain various methods of torque measurement rotating shafts.

(b) What are the various types of gages for low-pressure (vacuum) measurement ? Explain McLeod gage.

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6. Attempt any **one** part : $1 \times 10 = 10$

(a) Explain the working of pilot-static tube. Enlist the reasons due to which the difference between true and measured values of static pressure exists.

(b) Explain in detail with the help of diagrams, the operating theory of Rota meter.

7. Attempt any **two** parts. $2 \times 5 = 10$

(a) Give the working principle of radiation type temperature sensors. What are its disadvantages ?

(b) A resistance thermometer is to be constructed of nickel wire. Thermometer resistance at 20 degrees Celsius is 100 ohms. What length of 0.4 mm diameter wire should be used ? What would be the length if 2 mm diameter wire is used ?

(c) Explain the working principle of cooled thermocouples.