



Name :

Roll No. :

Invigilator's Signature :

CS/B.Tech (ICE-NEW)/SEM-4/EI(IC)-401/2013

2013

SENSORS AND TRANSDUCERS

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

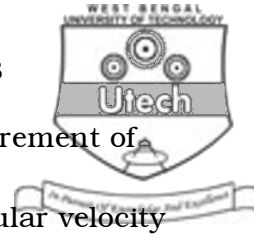
1. Choose the correct alternatives for any *ten* of the following : 10 × 1 = 10

i) Which of the following is a passive transducer ?

- a) Photovoltaic cell
- b) LVDT
- c) Piezoelectric transducer
- d) None of these.

ii) A Hall effect transducer can be used to measure

- a) power
- b) current
- c) displacement
- d) all of these.



iii) Seismic transducer is used for measurement of

- a) linear velocity
- b) angular velocity
- c) acceleration
- d) pressure.

iv) LVDT is a

- a) capacitive transducer
- b) resistive transducer
- c) inductive transducer
- d) none of these.

v) Piezoelectric crystals produce an *emf*

- a) when external mechanical force is applied
- b) when external magnetic field is applied
- c) when radiant energy simulated the crystal
- d) none of these.

vi) Dummy strain gauge are used for

- a) calibration of strain gauge
- b) compensation of temperature variation
- c) increase bridge sensitivity
- d) all of these.



- vii) Small linear displacement may be measured by
- a) Capacitive level gauge
 - b) LVDT
 - c) RVDT
 - d) None of these.
- viii) The material which shows the magnetostrictive effect is
- a) Force
 - b) Flow
 - c) Temperature
 - d) Displacement.
- ix) The output of current transducer is
- a) 0 mA — 20 mA
 - b) 4 mA — 20 mA
 - c) 3 mA — 20 mA
 - d) none of these.
- x) Rosette is a
- a) Rotating device
 - b) RTD
 - c) Strain gauge
 - d) None of these.
- xi) The photo diode as compared to a photo transistor has
- a) lower sensitivity
 - b) faster switching time
 - c) higher size for the same output
 - d) all of these.

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xii) Pyrometer is used for

- a) low temperature measurement
- b) medium temperature measurement
- c) high temperature measurement
- d) none of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Define gauge factor. Deduce the expression for the gauge factor. 1 + 4
3. Explain with diagram, operation of LVDT with I/O curve. 3 + 2
4. State the difference between active and passive transducer with example.
5. Explain with diagram, how to measure the non-conducting liquid level by using change of dielectric constant.
6. Calculate the charge sensitivity for piezo electrical material.

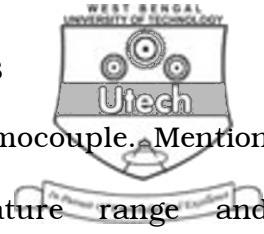


GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Briefly explain the different working principle of capacitive transducer. 3
- b) Calculate the sensitivity for differential arrangement type by using capacitive transducer. 5
- c) What do you mean by transducer ? Describe it with block diagram. What is difference between sensor and transducer. 1 + 4 + 2
8. a) Describe the working principle of RTD with diagram. 6
- b) Compare the different types of material used for RTD with graph. 3
- c) Explain the working principle of Total radiation pyrometer with diagram. 6



9. a) State the working principle of Thermocouple. Mention name along with their temperature range and composition of two commonly used thermocouples. 5
- b) Name two IC type temperature sensors. Explain any one of them with circuit diagram. 5
- c) What is temperature compensation ? Explain dummy gauge. 5
10. a) Discuss the below difference : 3 × 3
- i) RTD and Thermistor
 - ii) Primary and secondary transducer
 - iii) Seebeck effect and Peltier effect.
- b) Discuss proximity transducer. 3
- c) A metallic strain gauge has a resistance of 120Ω and a gauge factor of 2. It is installed on a aluminium structure which has a field point stress of 0.2 GN/m^2 , determine the change in resistance of the gauge what would be caused by loading the material to field point. 3



11. Write short notes on any *three* of the following : 3 × 5

- a) Rosettes
- b) Stroboscope
- c) Smart sensor
- d) Ultrasonic sensor
- e) Burdon Tube.

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