



Name :

Roll No. :

Invigilator's Signature :

CS / B.TECH(ICE / EEE) / SEM-4 / EI-401 / 2011

2011

TRANSDUCERS AND SENSORS

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) The transducer converts
 - a) mechanical energy into electrical energy
 - b) mechanical displacement into electrical signal
 - c) one form of energy into another form of energy
 - d) electrical energy into mechanical form.



ii) In a resistance POT high value of resistance of POT leads to

- a) high value of sensitivity
- b) low value of sensitivity
- c) low value of non-linearity
- d) low value of error.

iii) Gauge factor of a strain gauge indicates its

- a) accuracy
- b) sensitivity
- c) dead zone
- d) none of these.

iv) Small linear displacement may be measured by

- a) capacitive gauge
- b) LVDT
- c) both (a) & (b)
- d) none of these.

v) The smallest change in input that a transducer can sense is known as

- a) sensitivity
- b) resolution
- c) precision
- d) accuracy.



- vi) Primary and secondary winding of LVDT are wound on a tube of
- a) ferrite
 - b) laminated sheets of electric steel
 - c) copper
 - d) an insulating material like paper board.
- vii) Piezoelectric transducer is
- a) passive transducer
 - b) active transducer
 - c) inverse transducer
 - d) both (b) and (c).
- viii) Capacitive transducer are normally used for
- a) static measurement
 - b) dynamic measurement
 - c) both static and dynamic measurement
 - d) transient measurement.
- ix) 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.



x) Which of the following is a digital transducer ?

- a) Thermistor
- b) LVDT
- c) Encoder
- d) RTD.

xi) 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. Draw a suitable diagram of capacitor microphone and discuss its principle of operation. 5
3. What is meant by gauge-factor ? Derive the expression for the gauge factor. 1 + 4
4. What is the magneto-strictive phenomenon ? What do you mean by negative & positive magneto - strictive effect ? 2 + 3
5. Explain with neat diagram the operation of a piezoelectric transducer.
6. What is dynode ? Describe the working principle of L.D.R.

1 + 4

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GROUP – C

(Long Answer Type Questions)

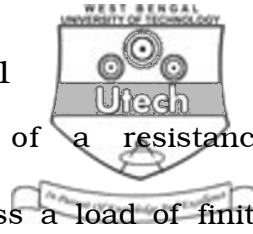
Answer any *three* of the following. $3 \times 15 = 45$

7. a) Draw the schematic diagram of an LVDT and explain its electromechanical transfer characteristics.
- b) Show an arrangement to extract the amplitude as well as the phase information contained in the ac output of an LVDT.
- c) Describe the basic principle of a Hall device and show how it can be used as a magnetic field sensor.

$5 + 5 + 5$

8. a) How can capacitive transducers be used to measure the level of the non-conducting type liquid ? What special arrangement should be done while measuring the level of conducting liquid ?
- b) Mention different factors on which capacitor transducer depends.
- c) How can thickness be measured by capacitive type transducer ?

$7 + 2 + 2 + 4$



9. a) Derive an expression for error of a resistance potentiometer when connected across a load of finite resistance. Draw curve to show the variation of error.
- b) Explain that the sensitivity and linearity are two conflicting requirements in resistance potentiometer.
- c) Briefly describe the constructional details of potentiometer. 6 + 4 + 5
10. a) Explain the difference between seebeck and peltier effect.
- b) Write the working principle of RTD.
- c) How can we measure high temperature using total radiation pyrometer ? 3 + 6 + 6
11. Write short notes on any *three* of the following : 3 × 5
- a) Active and passive transducer
- b) Ultrasonic transducer
- c) Photo-detectors



- d) Hall sensor
 - e) Unbonded strain gauge
 - f) Photo-multiplier tube
 - g) Rosettes.
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