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) oow 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 × 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

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 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 seeback 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 sbain gauge

f) Photo-multiplier tube

g) Rosettes.