MASTERS OF POWER ENGINEERING, 2ND SEMESTER EXAMINATION, 2013

POWER TRANSDUCER TECHNOLOGY

Time : Three Hours | Full Marks : 100

Answer question *1* and any *five* from remaining.

1. Write short notes on ***any four*** from the following. 4×5=20
   a) Strain gauge load cell,
   b) Piezoelectric microphone,
   c) Angular speed measurement using inductive proximity pickup,
   d) Dual slope A/D converter,
   e) Instrumentation amplifier,
   f) Fiber optic signal transmission,
   g) Charge amplifier.

2. a) Define active and passive transducer with suitable example of each.
   b) How potentiometer type transducer is used for displacement measurement?
   c) Define gauge factor for strain gauge and derive the expression for the same.
   5+5+(2+4)=16

3. a) States the properties of the material used for metal strain gauge.
   b) What is the function of the dummy strain gauge and when it is used?
   c) Find the expression for Quarter Bridge, Half Bridge and Full Bridge strain sensitivity and find the relation between them. 5+5+6=16

4. a) Define Sensitivity, Resolution, Reproducibility, Threshold and Dynamic error.
   b) 'Highly precise instrument need not be highly accurate.'-Explain.
   10+6=16

5. a) Draw the schematic diagram of LVDT and states its working principle along with modulated characteristics.
   b) Describe the demodulated characteristics of LVDT with necessary circuit diagram.
   c) State the reasons behind the residual voltage of LVDT.
   (2+4+2)+4+4=16

6. a) Define 'd' and 'g' coefficient for piezoelectric transducer and also find the relation between them.

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b) Define Villari effect and Widemann effect. Explain the working of the magnetostrictive torque transducer.

c) States the working of eddy current type transducer with suitable schematic diagram.

(2+3)+(2+4)+5=16

7. a) Why cold junction compensation is important for thermocouple? Discuss the hardware method of cold junction compensation with suitable circuit diagram.

b) '3-wire RTD configuration is more accurate than 2-wire RTD configuration.'-Explain with necessary calculation.

c) Explain the method of burnt-out protection for thermocouple.

(1+6)+6+3=16

8. a) Draw the functional block diagram of storage oscilloscope and describe the same.

b) States the features of the smart sensors.

(4+6)+6=16