

**BOARD OF TECHNICAL EDUCATION**  
PORVORIM-GOA  
November, 2008 Examinations

Programme: INSTRUMENTATION & CONTROL ENGG.

Course/Subject: TRANSDUCERS (4216)

Time Duration: 3 Hrs.

Max. Marks: 100

**INSTRUCTIONS:** 1. All Questions are compulsory.  
2. Figures to the right indicate full marks.  
3. Assume suitable additional data if required.

Q.No.1. Answer the following:- (4X5=20)

- a) State two examples each of:
  - i) active transducer.
  - ii) Passive transducer.
  - iii) Resistive transducer.
  - iv) Electrical transducer.
- b) Name transducer that performs following transductions:
  - i) Linear displacement into change in resistance.
  - ii) Rise in temperature into fall in conductivity.
  - iii) Fall in temperature into rise in resistivity.
  - iv) Applied force into output voltage.
- c) With neat figure, explain how capacitive principle can be used to measure level of conductive liquid.
- d) How can LDR be used to measure displacement.
- e) Explain any one method of non-contact type of angular velocity measurement.

Q.No.2. Answer any two:- (2X8=16)

- a) With help of expression, show how potentiometer develops output voltage proportional to wiper position. Describe the construction and characteristics of various types of potentiometers used as transducers.
- b) What is the principle of operation of a strain gauge? Define gauge factor. State its typical values in different strain gauge materials. Describe commonly used strain gauge constructions.
- c) With help of block diagram, explain the application of strain gauge in measurement of pressure. Draw output waveform at each stage. What provisions are made to take care of temperature induced resistance changes.

Q.No.3. Answer any two:- (2X8=16)

- a) Explain the principle of operation of a thermistor. State four points of difference between thermistor and RTD.
- b) With <sup>the</sup> help of diagram. Explain principle of operation of incremental encoder. How does it differ from absolute encoder?

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Q.No.3. Contd../-

- c) Draw block diagram of a typical temperature measurement system. clearly showing compensation techniques employed, and explain its working.

Q.No.4. Answer any two:- (2X8=16)

- a) Describe the advantages, disadvantages and applications of capacitive transducers.
- b) With help of block diagram explain measurement of pressure using capacitive transducer. Sketch output waveform at each stage.
- c) What is a differential output arrangement? How is it useful? Explain with figure and examples.

Q.No.5. Answer any two: (2X8=16)

- a) What are the different ways in which inductance variation occurs in inductive transducers? Explain with figures and expression.
- b) Explain the construction and operation of LVDT, with figure. How can it be modified to measure angular displacement?
- c) What is piezoelectric effect? Draw equivalent circuit of piezoelectric crystal. Describe modes of operation of piezoelectric crystal. state its applications.

Q.No.6. Answer any two:- (2X8=16)

- a) Write note on 'Electrical tachometers and their applications'.
- b) Describe the construction and principle of working of a fibre optic transducers. How is it useful in level measurement?
- c) Explain the operation of a shaft encoder that can transduce 16 analog positions of a motor into a 4-bit output.

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# BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

May/June, 2009 Examinations

Programme: INSTRUMENTATION & CONTROL ENGG.

Course/Subject: TRANSDUCERS (4216)

Time Duration: 3 Hrs.

Max. Marks: 75

INSTRUCTIONS: 1.All Questions are compulsory.  
2.Figures to the right indicate full marks.  
3.Assume suitable additional data if required.

- Q.1) Answer the following:- (5x3=15)
- State i) Four characteristics of ideal transducer  
ii) Four advantages of electrical transducer.
  - Name 4 resistive transducers and state their input and output quantities.
  - Write a brief note on LM & AD series of IC sensors.
  - With neat figure explain how capacitive principle can be used to measure level of non conductive liquid.
  - Explain how generation of eddy currents can be used in displacement measurement.
- Q.2) Answer any two:- (2x6=12)
- What is the principle of operation of a strain gauge? Define gauge factor. Briefly describe construction of various commonly used strain gauges. compare metallic and semiconductor strain gauges.
  - With help of block diagram explain measurement of pressure, using potentiometer, drawing relevant output waveforms at each stage.
  - Explain the principle of operation of LDR. How can it be used to measure pressure and displacement.
- Q.3) Answer any two:- (2x6=12)
- Explain principle of operation & characteristics of thermistors. Compare the same with that of RTD's.
  - With block diagram, explain practical temperature measuring system operation, employing suitable compensation techniques.
  - What is piezoelectric effect? How is it used in a transducer? Draw equivalent circuit of piezoelectric crystal. How is it used to measure force?
- Q.4) Answer any two:- (2x6=12)
- What are the various ways in which self inductance changes occur in inductive transducers? Explain the constructional details if such transducers.
  - With help of figure, explain the construction, operation and characteristics of LVDT. State its applications.
  - What is meant by single output/differential output arrangement? Explain and compare their operation, in capacitive or inductive transducer.

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Q.No.5) Answer any two:- (2x6=12)

- a) What are the various ways in which capacitive transducers attain variation in capacitance? Explain with figures expressions.
- b) With help of block diagram explain the measurement of pressure and displacement, using capacitive transducers, drawing relevant waveforms at each stage.
- c) Write a note on magneto electric type of transducers. Compare moving coil type with moving magnet type transducers.

Q.No.6) Answer any two:- (2x6=12)

- a) Write a note on 'Electrical Tachometers and their types'.
- b) Explain working of <sup>principle</sup> incremental encoder. Compare its performance with absolute encoder.
- c) Describe principle of operation, construction and application of fibre optic transducer in measurement of level.