B. Tech.

(SEM. VIII) EXAMINATION, 2006-07
INSTRUMENTATION & PROCESS CONTROL

Time : 3 Hours] [Total Marks : 100

Note : Attempt all questions.

1. Attempt any four parts of the following : 5×4=20
   (a) Discuss the criteria for selection of electrical transducer for any process.
   (b) Enlist the relative merits and demerits of analog and digital transducers. Describe the working principle of encoders.
   (c) Give the basic structure of an instrumentation system and explain how do you identify its various functional units in a mechanical pressure gauge.
   (d) Describe the construction and working of LVDT. What are the associated sources of errors in its use and how do you minimize/rectify them?
   (e) Discuss any two methods that could be used for measuring the speed of a rotating shaft. Also make a comparison of the methods proposed.
(f) Name the different types of resistive transducers. Describe the working principle of strain gauge. What are its typical sources of errors and how do you minimize them?

2 Attempt any four parts of the following: $5 \times 4 = 20$

(a) Discuss any two methods for measuring the flow rate of a fluid flowing through a pipe. Also give a comparison of the methods proposed.

(b) Describe various configurations of capacitive transducers. Explain how a capacitive transducer could be used for the measurement of liquid level.

(c) With the help of a suitable diagram, describe the working of "Hall-effect" transducer. Discuss its any two applications.

(d) What is telemetry and what are its basic components? Draw the block diagram of a telemetry system and explain the function of each component.

(e) What is impulse telemetering system? Describe various impulse telemetering systems used in practice.

(f) What do you understand by multiplexing? Explain frequency division multiplexing and time division multiplexing. Mention their relative merits and demerits.

3 Attempt any two parts of the following: $10 \times 2 = 20$

(a) What is the necessity of the signal conditioning in an instrumentation system? Name the various signal conditioning aspects.

VB-2030] 2 [Contd..
(b) What do you mean by an "Instrumentation amplifier" and a "Charge amplifier". Discuss their working and characteristics.

(c) Draw the block diagram of a general data acquisition system (DAS) and discuss its various components. Also give any other two configurations of DAS.

4 Attempt any two parts of the following: \(10 \times 2 = 20\)

(a) Write in brief about the basic control actions used in industrial analog process controllers.

(b) Give a schematic representation for a pneumatic controller. Discuss the functions of each component. Also enlist its merits, demerits and typical applications.

5 Attempt any two parts of the following: \(10 \times 2 = 20\)

(a) Explain the working principle of galvanometric type strip chart recorder. Discuss the different types of marking mechanism. Compare its features with those of magnetic type recorders.

(b) How does a wave analyzer differ from an harmonic distortion analyzer? Explain the working of a spectrum analyzer.

(c) Describe the working principle of analog storage CRO. Discuss its applications for the measurement of current, voltage, phase angle, frequency and time constant.