

Roll No.

Total Pages : 04

BT-7/M-20

37056

MEASUREMENTS AND CONTROL

ME-403-E

Opt. (i)

Time : Three Hours]

[Maximum Marks : 100

Note There are eight questions in this paper. All questions carry 20 marks. Attempt any questions in all by selecting at least one from each Section.

Section A

1. (a) Explain in detail drift, backlash, accuracy, precision and hysteresis with the help of examples.
- (b) Write a technical note on pneumatic and elastic load cells. **7**
- (c) The following table list the measuring instruments (left hand side column of the table) for measuring mechanical properties (right hand side column of the table) of the system. Student shall match the measuring instrument with the corresponding mechanical property :

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Measuring Instrument	Properties
Optical Pyrometer	Temperature
Bourdon gauge	Speed
Rotameter	Pressure
Tachometer	Flow rate

Further, students shall explain only the working principle of the measuring instrument listed on left hand side column of the table. **5**

2. (a) Explain in detail types of measurement with the help of examples. **8**
- (b) Write the various types of inputs to measuring instruments. **6**
- (c) Discuss in detail functional elements of a generalized measuring system. **6**

Section B

3. Derive an expression of the response of a first order mechanical system subjected to step and ramp inputs. **20**
4. Write short notes on the following :
 - (a) Seismic instruments
 - (b) Vibration pickups
 - (c) Pneumatic load cell
 - (d) Torque meter. **20**

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Section C

5. (a) How is transducer different from transformer ? Also explain in detail positive displacement meters and flow rate meters. **6**
- (b) Describe in brief total radiation pyrometer and semiconductor radiation sensor (thermistor).
- (c) Describe in brief Mathematical analysis of Ballast and DC Wheatstone bridge criteria. **6**
6. (a) Write various types of strain gauges. **7**
- (b) Explain in detail variable head meter and hot wire anemometer. **8**
- (c) Write short note on dynamic effects of connecting tubing. **5**

Section D

7. (a) Draw the signal flow graph for the following equations : **10**
- (i) $X_2 = 2X_1 + X_3 + X_2$, $X_3 = 5X_1 + 4X_2 + X_3$;
 $X_4 = X_2 + 2X_3$
- (ii) $X_2 = X_1 + 2aX_5$; $X_3 = 3bX_2 + 2cX_4$;
 $X_4 = 2dX_2 + 3cX_3$; $X_5 = 2fX_4 + 3gX_3$;
 $X_6 = 4X_3$

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(b) Write short notes on the following : **10**

- (i) Stability of control system
- (ii) Signal flow graph.

8. Obtain signal flow graph representation for a system whose block diagram is given below and using Mason's gain formula, determine the ratio C/R. **20**