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BT-7/D-18 37056

MEASUREMENT AND CONTROL

ME-403E

Time : Three Hours] [Maximum Marks : 100

Note : There are eight questions in this paper. All questions carry 20 marks each. Attempt *Five* questions in all, selecting at least *one* question from each Section.

Section I

1. (a) Define Calibration with regards to instruments. Also discuss comparison of mechanical and electrical measuring instruments. **6**

(b) Differentiate the following :

(i) Accuracy and precision

(ii) Backlash and Drift. **6**

(c) Explain in detail measuring standards and types of measurements. **8**

2. (a) A pressure gauge, which has linear calibration curve, has radius of scale line as 90 mm and pressure of zero to 60 Pascals is displayed over an arc of 300°C. Determine the sensitivity of the gauge as a ratio of scale length to pressure. **10**

(b) Explain in detail functional elements of a generalized measuring system. **10**

Section II

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) Statistical treatments of single and multi-sample type experimental data

(b) Best linear calibration and its precision

(c) Curve fitting

(d) Statiscal attributes of measuring system. **20**

Section III

5. (a) A simple electrical strain gauge of resistance 120 ohm and having a gauge factor of 2 is bonded to steel having an elastic stress of 400 MN/m^2 and modulus of elasticity is 200 GN/m^2. Calculate the :

(i) Change in resistance due to a change in stress equal to 1/10 of the elastic range.

(ii) Due to change of temperature of 20°C if the material is advance alloy. The resistance temperature coefficient of advance alloy is 20×10^{-6} /°C. **14**

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(b) Describe in brief Elastic load cell and providing rings. **6**

6. Describe in brief principle, theory, types, advantages and limitations of electrostatic transducers. **20**

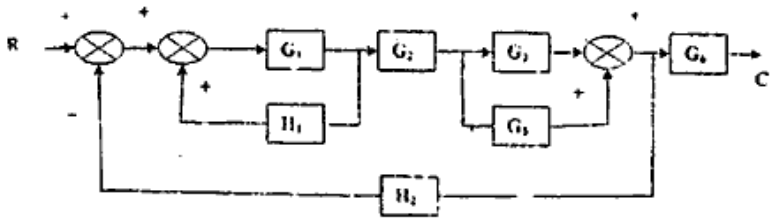
Section IV

7. (a) Draw the signal flow graphs for the following set of equations :

(Draw the signal flow graph of following equations : $X_2 + 5X_3 - 2X_1 = 0$; $X_3 + 2X_4 - 4X_2 = 0$; $X_4 - 8X_3 = 0$ **5**

(b) Write a technical note on linear controls systems and stability of a control system. **15**

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



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