

Roll No. ....

Total Pages : 03

**BT-7/M-20**

**37166**

**MEASUREMENT AND CONTROL**

**ME-401-N (Opt. II)**

Time : Three Hours]

[Maximum Marks : 75

**Note :** Attempt *Five* questions in all, selecting at least *one* question from each Unit. Unless stated otherwise, the symbols have their usual meaning in context with the subject. All questions carry equal marks.

**Unit I**

1. Distinguish between direct and indirect methods of measurement with the help of suitable examples. Also, explain how the resolution of digital instruments can be increased . **15**
2. Explain gross, systematic and random errors with the help of suitable examples. Also, define (a) Sensitivity, (b) Backlash, (c) Precision and (d) Resolution. **15**

**Unit II**

3. Explain in detail the methods of measuring torque. Also, explain how elastic sensing elements can be used for measurement of force. **15**

4. A metallic strain gauge has a resistance of 120 ohms and a gauge factor of 2. It is installed on an aluminium structure which has a yield point stress of  $0.2 \text{ GN/m}^2$  and Young's modulus of  $68.7 \text{ GN/m}^2$ . Determine the change in resistance of the material to yield point. **15**

### **Unit III**

5. Describe Variable Area Meter (Rotameter) for flow measurement with the help of a suitable diagram and mathematical derivation. Also, explain the method of calibration of Rotameter. **15**
6. A thermometer has been suddenly plunged into a steaming water bath whose temperature remains steady at  $100^\circ\text{C}$ . It takes 10 seconds for the thermometer to reach the equilibrium condition which occurs at five time constant ( $t = 5\tau$ ). Calculate the time constant and the time taken by the thermometer to indicate half of the temperature difference. The initial thermometer temperature can be considered to be zero. **15**

### **Unit IV**

7. Derive the relationship between state equations and transfer functions. **15**

8. Using block diagram reduction technique, determine the overall transfer function  $C(s)/R(s)$  for the system shown below : 15

