

(3 Hours)

[Total Marks : 100

N.B. : (1) Q. No.1 is compulsory

(2) Solve any four questions from remaining six questions.

(3) Assume suitable data if required.

(4) Draw neat sketches wherever required.

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| 1. | (a) Explain the working of Nozzle Flapper transducer. | 5 |
| | (b) Write a short note on pyrometer. | 5 |
| | (c) The assembly 50H8n7 represents a clearance fit. State True or False and justify | 5 |
| | (d) Explain the principle of GO and NO-GO gauge | 5 |
| 2. | (a) While measuring speed of turbine with stroboscope single line images were observed for stroboscope setting of 2400, 3800, and 6000 rpm. Calculate the speed of the turbine. | 5 |
| | (b) Write short note on (Any Three) | 15 |
| | (i) McLeod Gauge | |
| | (ii) Auto-Collimator | |
| | (iii) Piezoelectric Accelerometer. | |
| | (iv) Toolmaker's microscope | |
| 3. | (a) Explain generalized measurement system elements with block diagram. Describe its function with suitable example. | 10 |
| | (b) State the principle of operation of comparator. Explain the principle and working of a pneumatic comparator. | 10 |
| 4. | (a) Compare thermoelectric sensors on the basis of basic principle of working, materials used, characteristic behavior, range of operation and their types available. | 10 |
| | (b) State the working principle of LVDT with a neat sketch, indicating major elements of it. State in brief, two practical uses of LVDT in mechanical measurement. Indicate one similarity and one major difference between LVDT and Piezoelectric transducer | 10 |
| 5. | (a) Define strain gauge. What is gauge factor? Derive an expression for gauge factor of strain gauge. | 8 |
| | (b) Explain the method of employing sine bar for angle measurement. | 7 |
| | (c) Define static characteristics : | 5 |
| | i) Resolution ii) Sensitivity iii) Precision iv) Accuracy v) Drift | |

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6. (a) Discuss the elements of surface roughness. 5
 (b) What is meant by a "Best wire size"? Derive an expression for it. 5
 (c) The stress in M.S. flat circular diaphragm. 10

$$S = \frac{3D^2P}{16t^2} \text{ N/m}^2$$

where, D = Diameter in meter, t = Thickness in meter

P = Applied pressure in N/m²

Calculate stress and maximum possible absolute error if

$$D = 0.02 \text{ m} \pm 1 \%$$

$$t = 0.002 \text{ m} \pm 6 \times 10^{-6} \%$$

$$P = 40 \times 10^{-4} \text{ N/m}^2 \pm 1 \%$$

7. (a) A strain gauge is bonded to a beam 0.1 m long and has a cross-sectional area 4 cm². Young's modulus of elasticity for steel is 207 GN/m². The strain gauge has an unstrained resistance of 240 Ω and a gauge factor of 2.2. When a load is applied, the resistance of gauge changes by 0.013 Ω. Calculate the change in length of the steel beam and the amount of force applied to the beam. 5
- (b) Write short note on (Any Three) 15
- (i) Bridgeman gauge,
 - (ii) Standards of measurement
 - (iii) Use of slip gauges
 - (iv) Load cell