



- N.B. :** (1) Question No. 1 is **compulsory**.  
 (2) Attempt any **four** questions out of remaining **six** questions.  
 (3) Assume **suitable** data if **necessary**.  
 (4) Draw **neat** sketches wherever **necessary**.

1. (a) Explain generalized measurement system elements with block diagram. Describe its function with suitable example. 8
- (b) Explain the following terms :— 6
  - (i) Threshold and Resolution
  - (ii) Sensitivity and Drift
  - (iii) Hysteresis.
- (c) Define fit and classify it depending upon the actual limits of hole or shaft. Give example of each type of fit. 6
  
2. (a) A McLeod gauge has a bulb volume of 100 CC and a capillary diameter of 1 mm. Calculate pressure in Pascals corresponding to a readings of 30 mm column of Hg in the capillary. 5
- (b) A strain gauge is bounded to 0.1 m long has a cross sectional area 4 cm<sup>2</sup>, E = 207 GN/m<sup>2</sup> (Young's modulus of elasticity). Strain gauge has unstrained resistance = 240 Ω and G<sub>T</sub> = 2.2. When load is applied, the resistance of gauge changes by 0.013 Ω. Calculate change in length and amount of force applied to beam. 5
- (c) While measuring speed of a steam turbine with a Stroboscope, stationary images were observed for three consecutive Stroboscope setting 3000, 4000 and 5250 flashes per minute. Calculate the rotational speed of turbine. 5
- (d) A dead zone of certain pyrometer is 0.15% of the span. The calibration is 500°C to 859°C. What temperature change might occur before it is detected. 5
  
3. (a) The resistance of copper wire is expressed as :  $R = R_0[1 + \alpha(T - 20)]$  10  
 where  $R_0 = 5\Omega \pm 0.2\%$  is the resistance at 20°C.  
 $\alpha = 0.004$  per °C  $\pm 1\%$  is the temperature coefficient of resistance.  
 $T = 30 \pm 1^\circ\text{C}$  is the temperature of wire.  
 Calculate resistance of wire and its uncertainty.
- (b) Discuss any two methods of displacement measurement giving their advantages and limitations. 10
  
4. (a) Explain different principles of working of capacitive transducer. Also discuss advantages, disadvantages and uses of capacitive transducers. 12
- (b) Explain the three wire method for checking the pitch diameter of screw. 8
  
5. (a) Explain use of slip gauges. 10  
 Describe the measurement of cone angle of taper plug gauge by using sine bar.
- (b) Define gauge factor of strain gauge and also derive an expression for it. 10
  
6. (a) Explain with neat sketches the working of a piezoelectric accelerometer. 6
- (b) What are desired, modifying and interfering inputs ? Explain with examples. Also suggest the methods to minimize the effect of modifying and interfering inputs. 8
  
7. Write short notes on any **four** of the following :— 20
  - (a) Tool makers's microscope
  - (b) Auto collimator
  - (c) Torque sensors
  - (d) Inter changeability and its importance
  - (e) Calibration of pressure sensor.