

College of Engineering Pune
(An Autonomous Institute of Govt. of Maharashtra)
END SEMESTER EXAMINATION

(PE-208) Metrology and Mechanical Measurements

Programme: S.Y.B.Tech. (Mechanical Engineering)

Duration: 03 hr

Year: 2011-2012

Max. Marks: 50

Instructions:

1. All questions are compulsory
2. Draw neat figures wherever required.
3. Assume suitable data if necessary.

SECTION-A

- Q.1A Why is the assessment of surface texture important? Describe any one method used for obtaining a numerical value of the texture from a given graphical record. 3
- B Define i) Waviness ii) Lay, in relation with surface texture assessment. 2
- Q.2 What is optical flat explain how interference fringes are formed when optical flat is placed on a surface to be tested. 5

SECTION-B

- Q.3 Derive the equation for time response of first order system subjected to ramp input and find its steady state error. 5
- Q.4 State Bernoulli's theorem, obtain an expression for the volume flow rate of a one dimensional incompressible frictionless fluid flow through a horizontal pipe installed with an orifice meter 5
- Q.5 Select appropriate sensor with logical reasoning for following applications 5
- A. Flow measurement of slurries
 - B. Temperature measurement of furnace (Temp.= 1800°C)
 - C. Level measurement in a tank containing powder
 - D. Level measurement of petrol in a tank
 - E. A speed of an aeroplane on runway
- Q.6 A venture tube of throat diameter 5 cm has a discharge coefficient of 0.98 and with a flow rate of 10m³/s the pressure differential is 12.5 kPa. Determine the flow rate when an orifice of 5 cm is used in the same pipe (C_d=0.60) and the pressure differential is the same. 5
- Q.7A Why is platinum normally used in the construction of precision standard RTD. State its measuring temperature range 3
- B Explain: A. Cold Junction compensation 2
B. Lead wire compensation

- Q.8 Discuss the principal of operation of strain gauge. What is the gauge factor? A resistance strain gauge with gauge factor of 2 is fastened to a member, which is subjected to a strain of 1×10^{-6} . If the original resistance value of the gauge is 30 ohm. Calculate the change in resistance 5
- Q.9 Explain the working principal and applications of following sensors/transducers 5
- A. Bi-metallic strip thermometer
 - B. Turbine type flow meter
 - C. Electromagnetic flow meter
 - D. Thermocouples
 - E. Thermistors
- Q.10 A linear, second order, single degree of freedom system has a mass of 4gm and stiffness 1000N/m. Calculate the natural frequency of the system. Determine the damping coefficient necessary to just prevent overshoot in response to step input 5
