

**B.Tech. MECHANICAL ENGINEERING
(COMPUTER INTEGRATED
MANUFACTURING)**

00959

Term-End Examination

June, 2015

BME-014 : METROLOGY AND INSTRUMENTATION

Time : 3 hours

Maximum Marks : 70

*Note : Answer any **seven** questions. Use of scientific calculator is permitted. Assume missing data suitably, if any.*

1. (a) Mention the units for the following mechanical quantities :
Force, work, energy, acceleration and power in CGS, FPS and SI systems. 5
- (b) Stress is measured in units lbf/m^2 in the English system of units. Derive the factor to convert to units N/m^2 and kgf/m^2 . 5
2. (a) Differentiate between precision and accuracy. 4

(b) A resistor has a nominal stated value of $10 \pm 0.1 \Omega$. A voltage difference occurs across the resistor and the power dissipation is to be calculated in two different ways :

(i) $P = E^2/R$ (ii) $P = EI$

In (i) only a voltage measurement will be made, while both current and voltage will be measured in (ii). Calculate the uncertainty in the power for each case when the measured value of E and I are :

$$E = 100 \pm 1 \text{ V (for both cases)}$$

$$I = 10 \pm 0.1 \text{ A}$$

6

3. (a) Explain with a neat diagram the essential conditions of interference and clearance fits. 5

(b) Differentiate between Hole-base system and Shaft-base system. 5

4. (a) Classify the gauges based on different criteria. 5

(b) Differentiate between standard and limit gauges. 5

5. List the essential parts of a micrometer and explain its working, giving a neat sketch. 10

6. Give the classification of comparators and differentiate between mechanical and pneumatic comparators. 10
 7. (a) Discuss the limitations of the use of a sine bar. 4
(b) Describe the working of an auto-collimator. 6
 8. What are the various types of projectors ? Mention the advantages of optical projectors. 10
 9. Explain the working principle of co-ordinate measuring machine with a neat sketch. 10
 10. List the common sources of light used for interferometry and explain the essential properties of light wave for interference. 10
-