

**BACHELOR OF TECHNOLOGY IN  
MECHANICAL ENGINEERING  
(COMPUTER INTEGRATED  
MANUFACTURING)**

**Term-End Examination**

**December, 2013**

**BME-014 : METROLOGY AND  
INSTRUMENTATION**

*Time : 3 hours*

*Maximum Marks : 70*

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**Note :** *Answer any five questions. All questions carry equal marks. Use of scientific calculator is permitted.*

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1. (a) What is the difference between primary and secondary standards ? 4
- (b) Mention the fundamental SI units which are used in mechanical system. 3
- (c) What are the standard units of electrical quantities ? 7
  
2. (a) Define error in the measurement and classify types of errors. Explain each one in brief. 7
- (b) What is the difference between accuracy and precision ? 2
- (c) What is the need of calibration of a measuring instrument ? Write the procedures of calibrating a pressure gauge. 5

3. (a) Define fit and its classes. 3  
 (b) What are the two systems of fit ? Illustrate with the help of diagrams. 5  
 (c) Define tolerance. What are unilateral and bilateral tolerances ? Find the type of fit and amount of maximum and minimum clearance/interference for a pair of shaft and hole defined as follows : 6
- Shaft dia :  $45.0^{+0.055}_{+0.050}$   
 hole dia :  $45^{+0.055}_{-0.025}$
4. (a) Classify gauges based on the purposes for which they are used. 6  
 (b) Name the gauges to be used for following : 4  
 (i) Shaft (ii) Wire  
 (iii) Nut (iv) Hole  
 (c) What are the functions of the following gauges ? 4  
 (i) Form gauge  
 (ii) Taper gauge  
 (iii) Air gauges  
 (iv) Reference gauge
5. (a) What are the different types of caliper for measuring the linear dimensions ? Describe any one in detail. 7  
 (b) List various types of micrometers. Describe screw thread micrometer caliper. 7
6. (a) What are the different types of comparators ? Describe mechanical comparators in brief with neat sketch. 9  
 (b) What are the advantages of electrical comparators over mechanical comparators ? 5

7. (a) What is a sine bar? How is it used to measure an angle between two surfaces? Could you measure all angles with this arrangement? 7
- (b) Explain the working principle of an autocollimator. 7
8. (a) What are the advantages of co-ordinate measuring machine? 3
- (b) Which instruments are used for measuring flatness or small differences in length? Describe one such instrument with the help of sketch. 7
- (c) What are the differences between constructive and destructive interference? 4
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