

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

**Term-End Examination**

**00624**

**June, 2017**

**BME-014 : METROLOGY AND INSTRUMENTATION**

*Time : 3 hours*

*Maximum Marks : 70*

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

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1. (a) What is the effect of temperature variation on the measurement ?  
(b) Give a brief description of the important parts of a Co-ordinate Measuring Machine (CMM). Also explain its working. 3+7
  
  2. A hole is dimensioned as  $25^{+0.033}_{+0.00}$  and the shaft is dimensioned as  $25^{-0.40}_{-0.061}$ . Determine the hole tolerance, the shaft tolerance and the allowance of the fit. What type of fit shall be established ? 10

3. (a) Three 12 inch gauges A, B and C are measured on a level comparator by first wringing them together and then comparing with a 36 inch gauge and then intercomparing them. The 36 inch gauge actually measures to be 36.00009 inches and the three gauges together are found to have combination length of 36.00014 inches. Gauge A is 0.00008 inches longer than gauge B but shorter than gauge C by 0.00004 inches. Determine the corrected length of each gauge.
- (b) What is the speciality of a toolmaker's microscope as compared to an ordinary laboratory microscope? 6+4
4. (a) Describe briefly the vernier height gauge. Why is it considered as a superior marking tool? Explain with an example.
- (b) What is a comparator? Classify the different types of comparators. 5+5
5. (a) Why are holes drilled in the body of a sine bar? Which material is used for manufacturing a sine bar and why?
- (b) Discuss the various factors affecting the accuracy of a sine bar. Explain with an example. 5+5
6. (a) Why is it necessary to give a tolerance on an engineering dimension? Give an example of both, a bilateral and a universal tolerance.
- (b) Define 'errors' in measurement. Differentiate between systematic errors and random errors. 5+5

7. (a) What is meant by 'accuracy' of a measuring instrument? Also, explain the term 'repeatability' of an instrument. Give suitable examples.
- (b) What is meant by 'magnification'? What is the difference between magnification and amplification? 5+5
8. (a) Describe briefly the construction and graduation of a vernier micrometer giving an example of how to read it and also give the least count.
- (b) What is meant by surface finish? Name one application where surface roughness plays an important role. 6+4
9. (a) Discuss briefly the need for precision measurements in an engineering industry.
- (b) Sketch a vernier calliper and name its different parts. How will you measure the thickness of a plate by the vernier calliper? 4+6
10. (a) Explain the phenomenon of optical interference.
- (b) Describe in brief the working principle of an autocollimator with suitable sketches. 4+6
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