

**B.Tech. – VIEP – MECHANICAL ENGINEERING
(BTMEVI)**

Term-End Examination

December, 2014

00905

BIME-019 : METROLOGY

Time : 3 hours

Maximum Marks : 70

Note : Attempt any *five* questions. All questions carry equal marks.

1. (a) Define tolerance and describe the types of tolerances. If the diameter of a shaft may vary from 25.05 mm to 25.10 mm, show tolerance on a sketch with basic size of 25.00 mm. 7

- (b) The diameters of shaft and holes are prescribed as

$$25 \begin{matrix} +0.025 \\ -0.015 \end{matrix} \text{ and } 25 \begin{matrix} +0.03 \\ -0.00 \end{matrix}$$

respectively. Find the extreme values of diameters and see if there is any chance and that the clearance between the shaft and the hole may not exist. 7

2. (a) Define interference, transition, and clearance fits. Give examples where they are used. If the shaft in a hole has to be lubricated, which type of fit will be used ? Explain. 7
- (b) Answer the following questions : 7
- (i) What is the accuracy of a vernier caliper ?
 - (ii) What is the accuracy of a micrometer ?
 - (iii) What is the difference between a 1 MSD and 1 VSD ?
 - (iv) What is the pitch of a micrometer screw ?
 - (v) What is the value of each division of the thimble of a micrometer ?
 - (vi) What is the number of divisions on the thimble of a micrometer ?
 - (vii) What is the smallest graduation which can be clearly seen on a metric rule ?
3. (a) Name the instruments for measuring of dimensions that are based on optical principles. What are the principles of optical projector ? 7
- (b) Describe the advantages of profile projector. 7

4. (a) Show clearly what is meant by interference of light. How does the nature of the light source affect the phenomenon ? How may interference be used in length measurement, flatness measurement, and in the measurement of parallelism ? 7
- (b) A steel shaft is made within limits on its diameter of 60.02 mm and 59.96 mm. State the upper and lower limits of the bore size of a bush to give a maximum clearance of 0.10 mm and a minimum clearance of 0.02 mm. 7
5. (a) What is a comparator ? Classify the different types of comparators. Describe the advantages and disadvantages of each type. 7
- (b) Define the terms "primary texture", and "secondary texture". Describe in detail, one type of instrument used for obtaining a graphical record of the primary texture. 7
6. (a) When measuring the minor diameter of an external screw thread gauge for ISO metric threads, a 30.500 mm diameter cylindrical standard was used. The micrometer readings over the standard and prisms, and the gauge and prisms were 13.3768 mm and 13.5218 mm respectively. Calculate the thread gauge minor diameter. 7
- (b) Draw an illustrative (but simple) line diagram of a pitch measuring machine and describe its working. 7

7. (a) Ten percent of the pieces produced in a certain manufacturing process turn out to be non-conforming. Find the probability that in a sample of 10 pieces chosen at random, exactly 2 will be non-conforming by using the binomial distribution. 7
- (b) (i) What is the least count of an ordinary vernier caliper ?
- (ii) What is the least count of an outside micrometer ?
- (iii) Describe the construction and graduation of a vernier micrometer, giving an example of how to read it. 7
8. (a) Describe straight edge. List its main applications. 7
- (b) Why are tolerances provided on dimensions of the components ? Explain each type of fit with suitable examples. 7
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