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BIMEE-006

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

Term-End Examination

00635 **December, 2014**

BIMEE-006 : TRIBOLOGY

Time : 3 hours *Maximum Marks : 70*

Note : *Answer any* ***seven*** *questions. Draw neat sketches wherever required. All questions carry equal marks. Assume any missing data. Use of scientific calculator is allowed.*

1. (a) Describe the mechanism of Sliding Friction using the Classical theory of Adhesion as given by Bowden and Tabor. *5*

   (b) A hard ball is sliding against a soft and flat surface at two different loads. At one load the coefficient of friction is 0·20 and the groove width is 0·5 mm and at another load, the coefficient of friction is 0·25 and the groove width is 1 mm. Calculate the radius of the ball and the adhesive component of the coefficient of friction. Assume that the dominant sources of friction are adhesion and ploughing and these are additive. *5*

2. (a) Differentiate between two body abrasion and three body abrasion using appropriate examples. *5*

(b) Describe briefly, using neat sketches, any two deformation modes responsible for material removal during abrasion. *5*

3. (a) What is solid particle erosion ? How is it different from liquid impingement erosion ? *5*

(b) Give the quantitative equation governing erosion or erosive wear. *5*

4. (a) Classify the different types of wear particles based on the different wear mechanisms. *5*

(b) What is the effect of operating environment on the wear of ceramics ? Is it different from that of polymers ? *5*

5. (a) Give the expression for the mean contact pressure for a single asperity contact of homogeneous and frictionless solid. *5*

(b) State and describe at least three surface properties that are associated with wear, based on geometrical, mechanical, physical and chemical parameters. *5*

6. (a) Describe the elastic-plastic contact of frictionless solids. What will be the mode of deformation ? *5*

(b) Describe the physico-chemical properties of surface layers using a neat diagram. *5*

7. (a) What are the additives used in lubricating oils ? Give their classification. What are their basic functions ? *5*

(b) Differentiate between natural oils and synthetic oils used as lubricants, with appropriate examples of each. *5*

8. (a) What are the physical and chemical properties of lubricants and what are they based on ? *5*

(b) Discuss the flash point of a lubricating oil. *5*

9. (a) What are the steps to be followed in selection of a bearing for a particular application ? *5*

(b) Classify the different types of bearing used in the various mechanical applications along with their salient features. *5*

10. (a) Calculate the power loss in a bearing operating with SAE 30 oil at 40°C, if the journal rotates at 100 rpm. The diameter of journal and clearance in the bearing are 25 mm and 0·05 mm respectively. If the radial load on the bearing is 1250 N and L/D ratio is 1, calculate the effective coefficient of friction and parameter $\frac{\mu N}{P}$. *5*

(b) What steps can be taken to prevent heating of bearings ? *5*