Roll No ....

ME-8003(1) (CBGS)

B.E. VIII Semester

Examination, November 2019

Choice Based Grading System (CBGS)

Tribology

Time : Three Hours

Maximum Marks : 70

Note: i)   Attempt any five questions.

ii)   All questions carry equal marks.

iii)   Draw neat diagram wherever necessary.

1. a)   Discuss in details various tribo-models for asperity contact.
   b)   What is the role of friction in Tribology?

2. a)   Explain basic mechanisms of sliding friction.
   b)   A hard ball is slid 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 plowing and that these are additive.

3. a)   Define stick-slip and explain mechanisms of stick-slip.
   b)   Discuss the effect of operating conditions on coefficient of friction of metals and alloys.

4. a)   Define the term wear? Draw the wear maps and explain their salient features with reference to wear mechanisms.
   b)   The flat face of a brass annulus having an outside diameter of 20 mm and an inside diameter of 10 mm is placed on a flat carbon steel plate under a normal load of 10 N and rotates about its axis at 100 rpm for 100 h. As a result wear during the test, the mass losses of the brass and steel are 20 mg and 1 mg, respectively. Calculate the wear coefficients and wear depths for the bronze and the steel. (Hardness of steel = 2.5 GPa, density of steel = 7.8 Mg/m³, hardness of brass = 0.8 GPa and density of brass = 7.5 Mg/m³).

5. a)   What is wear rate? Explain various types of wear mechanism.
   b)   A milling cutter was used to saw through a medium carbon steel bar (H = 3 GPa) of 10 mm diameter with a width of cut of 0.5 mm. It took 10 minutes to saw and the energy expended was 50 W (Nm/s). The coefficient of friction between the saw and the steel bar is 3.0. Calculate the wear coefficient of the steel bar during the cutting process.

6. a)   What are the basic functions of a lubricant? List the important factors to be consider in the selection of lubrication system for given application.
   b)   Explain different types of additives for developing a good lubricant.

7. a)   How do you distinguish between bearings from the standpoint of cooling conditions? Explain the categories with equation that are applicable under each.
   b)   Define a seal. Draw the T-diagram of classification of seals. Explain the clearance seals with neat sketch.

8.   Write short note on:
   i)   Laws of friction
   ii)   Wear prevention mechanisms
   iii)   Industrial methods of lubrications

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