CBCS SCHEME

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15ME742

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
Tribology

Time: 3 hrs.

Max. Marks: 80

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Briefly explain the history of Tribology. (08 Marks)
   b. With a neat sketch, explain any two practical importance of Tribology. (08 Marks)

OR

2 a. What is the importance of Lubricant? Explain the requirements of a good lubricant. (10 Marks)
   b. At the bottom of a uniform cylindrical vessel of 30cm height a horizontally capillary tube of 2mm inner diameter and 10cm length is connected to discharge the liquid. Calculate the rate of discharge of the liquid. If the vessel contains
   i) Water of viscosity 0.01 poise and ii) Oil of viscosity 0.84 poise to 2/3 capacity. Take density of water and oil as 1 gm/cc and 0.9 gm/cc respectively. (06 Marks)

Module-2

3 a. What are the theories friction and explain any two theories and test measurement? (08 Marks)
   b. How do you classify mechanism of wear and explain any one measurement of Test method? (08 Marks)

OR

4 a. What is Delamination theory and explain? (08 Marks)
   b. Write short notes on friction of metals and non – metals. (08 Marks)

Module-3

5 a. Derive Petroff's equations for lightly loaded journal bearings. State assumptions. (08 Marks)
   b. Determine Load carrying capacity, Frictional force and power loss due to friction for an Ideal full Journal bearing for the following specifications :
   Diameter of Journal = 5 cm ;   Speed of Journal = 1200 rpm ;   Length of bearing = 6.5cm
   Radial clearance = 0.0025cm ; Average viscosity = 1.6×10^{-6} Renolds ; Attitude = 0.8. (08 Marks)

OR

6 a. With a neat sketch, explain Partial Journal Bearing and Effect of End leakage. (06 Marks)
   b. A Journal bearing of width 1m operates with a shaft of 100mm diameter which rotates at 1200 rpm. The diametral clearance is 200 μm and absolute viscosity of the lubricating oil is an at inlet temperature of 20^{0}C is 40 Cp for an eccentricity ratio of 0.7. Calculate the minimum film thickness, Attitude angle, Maximum film pressure , location load capacity and co-efficient friction. (10 Marks)
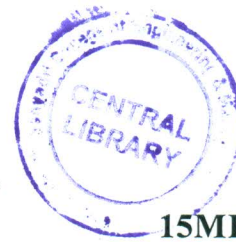
Module-4

7 a. Derive an equation for maximum pressure distribution for a plane slider bearing given by

$P_m = \dfrac{\eta\,u\,\ell}{h_0^2}\,\overline{P}_m$, with usual notations. **(08 Marks)**

   b. A fixed inclined pad thrust bearing of length 100mm and width 500mm, with a minimum film thickness of 50 μm, operates at a sliding velocity of 1m/s with a mineral oil of absolute viscosity of 30 Cp. Calculate the i) Maximum pressure and location   ii)   Normal load capacity and   iii) Stiffness of the oil. Take m = 1.889. **(08 Marks)**

OR

8 a. Derive an equation for load carrying capacity of Hydro static lubrication. **(08 Marks)**
   b. A Hydrostatic thrust bearing with a circular step pad has an outside diameter of 400mm and recess diameter of 250mm.
   i) Calculate the pressure for a thrust load of 100kN.
   ii) Find the volumetric flow rate of the oil which will be pumped to maintain the film thickness of 150 μm with an viscosity of 30Cp and
   iii) Calculate the film stiffness. **(08 Marks)**

Module-5

9 a. Name the commonly used Bearing materials and explain any two bearing material properties. **(08 Marks)**
   b. What are the advantages and disadvantages of Bearing materials? **(03 Marks)**
   c. Write a note on Scope of Surface Engineering. **(05 Marks)**

OR

10 Write a short note on the following :
   a. Surface modification.
   b. Thermo chemical process.
   c. Vapor phase process.
   d. Wear and Corrosion resistance. **(16 Marks)**

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