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15ME742

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Tribology

Time: 3 hrs.

Max. Marks: 80

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

Module-1

1 a. What are the desirable properties of Lubricating oil? **(06 Marks)**
   b. Discuss the effect of temperature and pressure on viscosity. **(06 Marks)**
   c. Discuss the purpose of lubrication. **(04 Marks)**

OR

2 a. Discuss the types of lubricant and the applications. **(06 Marks)**
   b. Write a note on selection of lubricants. **(06 Marks)**
   c. Discuss the important application of tribology. **(04 Marks)**

Module-2

3 a. With a neat sketch, explain the measurement of friction by pin on disc equipment. **(08 Marks)**
   b. Explain adhesion theory of friction by Bowden and Tabor. Also list the limitations. **(08 Marks)**

OR

4 a. Define Wear. Discuss the different types of wear with neat sketches. **(10 Marks)**
   b. Write a note on wear of ceramic materials. **(06 Marks)**

Module-3

5 a. Derive the Petroff's equation for a lightly loaded bearing. Also indicate the assumption made. **(08 Marks)**
   b. A full journal bearing has the following specification, shaft diameter 45mm, bearing length 65mm, radial clearance is 0.0015, speed 2800 rpm, radial load 800N, viscosity of lubricant at effective temperature is 8.27×10^{-3} Pa.S. Considering the bearing as lightly loaded, determine i) Friction torque at the shaft   ii) Co-efficient of friction   iii) Power loss. **(08 Marks)**

OR

6 Derive Reynold's equation in 2D [two – dimension]. Also state the assumption made. **(16 Marks)**

Module-4

7 a. Derive an expression for load carrying capacity of a plane slider bearing with fixed shoe. **(10 Marks)**
   b. A rectangular plain slider bearing with fixed shoe and with no end leakage has the following data :
   i) Bearing length – 90mm   ii) Width of shoe – 90mm   iii) Load on bearing – 7800N.
   iv) Slider velocity – 250×10^{-2} mts/sec   v) Inclination $\alpha = -0.00035$ radians
   vi) Viscosity of oil $\eta = 40$ Cp.
   Determine I) Minimum film thickness II) Power loss III) Co-efficient of friction. **(06 Marks)**

OR

8 a. Derive an expression for load carrying capacity of hydrostatic step bearing. Also state the assumption made. **(10 Marks)**

   b. A hydrostatic circular thrust bearing has the following data : Shaft diameter = 300mm , Diameter of pocket = 200mm ; Shaft speed = 100 rpm ; Pressure at the pocket = 500kN/m^2 ; Film thickness = 0.07mm ; Viscosity of lubricant = 0.05Pas. Determine i) Load carrying capacity
   ii) Oil flow rate   iii) Power loss due to friction. **(06 Marks)**

Module-5

9 a. Describe briefly the desirable properties of a bearing material. **(08 Marks)**

   b. Explain briefly the commonly used bearing alloys. **(08 Marks)**

OR

10 a. What are the various modes by which surface properties can be enhanced? **(08 Marks)**

    b. With a neat sketch, explain laser cladding. **(08 Marks)**

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