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15ME742

Seventh Semester B.E. Degree Examination, Feb./Mar. 2022
Tribology

Time: 3 hrs. Max. Marks: 80

Note : 1. ***Answer any FIVE full questions, choosing ONE full question from each module.***
2. ***Use of Design Data handbook is permitted.***
3. ***Any missing data maybe suitably assumed.***

Module-1

1 a. Define Tribology and explain practical importance of Tribology. **(06 Marks)**
b. State the types of lubricants and desirable properties of Lubricants. **(06 Marks)**
c. Define the terms : i) Viscosity and ii) Newtonical fluid. **(04 Marks)**

OR

2 a. List the different types of viscometers to measure viscosity and with neat sketches, explain any two of viscometers. **(10 Marks)**
b. Explain effect of temperature and pressure on viscosity. **(06 Marks)**

Module-2

3 a. Define Friction and explain Friction theories. **(10 Marks)**
b. Write a note on Friction in metals and non metals. **(06 Marks)**

OR

4 a. Define Wear. Name different types of Wear. **(04 Marks)**
b. Explain any four types of wear with appropriate sketches. **(12 Marks)**

Module-3

5 a. Derive Petroff's equation for coefficient of friction in a lightly loaded bearing. **(08 Marks)**
b. A full Journal bearing has the following specifications :
Journal diameter = 60mm ; Bearing length = 60mm ; Radial clearance = 0.05mm
Speed of Journal = 2000 rpm ; Mean viscosity of the lubricant = 10Cp
Eccentricity ratio = 0.8 ; Location of inlet hole = 220° ; Inlet pressure = 0.3MPa.
Determine the location and magnitude of maximum and minimum pressure. **(08 Marks)**

OR

6 State the assumptions and derive Reynold's equation in two dimensions. **(16 Marks)**

Module-4

7 a. A slider bearing with a rectangular shoe has the following specifications :
Length of the shoe in direction of motion = 75mm ; Width of the shoe = 115mm
Velocity of moving member = 2m/sec ; Expected mean temperature of oil = 80°C
Permissible film thickness = 0.023mm ; Viscosity of oil = 34.5 Cp
Determine i) Load carrying capacity ii) Power loss in the bearing.
Assume that the inclination of the bearing surface corresponds to the maximum load carrying capacity. Neglect the effects of end flow on the bearing. **(08 Marks)**
b. Derive the expression for rate of flow of oil in an hydrostatic step bearing. **(08 Marks)**

OR

8 a. A rectangular plane slider bearing with a fixed shoe has the following details :
Bearing length in direction of motion = 80mm ; Width of bearing = 101mm
Slider velocity = 1.27m/sec ; Mean viscosity of lubricant = 17.24 Cp
Minimum fluid film thickness = 0.02mm ; Maximum fluid film thickness = 0.05mm
Draw the pressure distribution curve for the slider bearing. **(08 Marks)**

b. The following are the particulars of a Hydrostatic step bearing :
Thrust load = 500KN ; Shaft diameter = 500mm ; Recess diameter = 250mm
Film thickness = 0.015mm ; Viscosity of oil = 48Cp.
Determine the inlet pressure and oil flow. **(08 Marks)**

Module-5

9 a. List the requirements of a good bearing material and discuss any two in brief. **(10 Marks)**

b. What are the objectives of Surface Engineering for tribological applications? **(06 Marks)**

OR

10 a. List commonly used bearing materials. Explain any two of them with respect to their typical properties and advantages. **(10 Marks)**

b. What are the methods used in Surface Engineering. **(06 Marks)**

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