

Pravat - 15040131

Total Pages-5

(Set-1)

M.Tech - 2nd(MDA)
Tribology

Full Marks : 70

Time : 3 hours

Answer any six questions including Q. No. 1

The figures in the right-hand margin indicate marks

1. Answer the following questions : 2 × 10
- (a) State the importance of tribology in the industry.
- 15 (b) Define Fluidity.
- (c) State the properties of solid lubricant.
- (d) State the types of restrictor used in hydrostatic bearing.
- (e) What do you mean by sintered metal bearing?

(Turn Over)

1. (i) Name two solid lubricants.
 - (ii) Write down the complete Reynolds equation in two dimensions.
 - (iii) State the advantages of long bearing over short bearings.
 - (iv) State a brief classification of lubricating oils.
 - (v) State strengths of gas bearing.
2. (a) Discuss the role of additives in lubricating oil. Describe the common additives with their applications. 5
- (b) Determine the flow rate through a capillary of inside diameter 0.7 mm and length 2.8 meter. The absolute viscosity of fluid is 2 centipoise and the pressure difference maintained is 35 KPa. Assume laminar flow? 5
3. (a) Derive Petroffs' equation and state its significance? 5
- (b) Find the power loss and coefficient of 6

friction for a petroff bearing having diameter 100 mm and length 150 mm. Radial clearance 0.05 mm and rotational speed 900 rpm. The viscosity of SAE 10 grade oil is $6.75 \times 10^{-2} \text{ N sec/m}^2$. 5

4. (a) Explain how heat balance in journal bearing is achieved? 4
- (b) Explain the following terminology : 6
- (i) Boundary lubrication
 - (ii) Mixed lubrication
 - (iii) Elastohydrodynamic lubrication.
5. (a) State the advantages of pivoted pad over fixed pad slider bearing. 3
- (b) A rectangular plane slider bearing has the following specifications : 10
- Bearing width = 80 mm, Bearing Length = 150 mm, Load = 20 KN, Sliding speed = 2.0 m/s, Minimum oil film



thickness = 0.02 mm, Maximum oil film thickness = 0.05 mm and absolute viscosity of oil is 0.02 Pas.

Find (i) The load carrying capacity (ii) pressure at a distance 50 mm measure from the maximum film thickness point. (Neglect side leakage)

6. (a) Describe the systems of hydrostatic lubrication and its applications. State the role of restrictors in hydrostatic bearing ?

(b) The following data is given for a hydrostatic bearing of a vertical turbo generator :

Thrust load = 450 KN shaft diameter = 400 mm, recesses diameter = 250 mm, shaft speed = 750 rpm, viscosity of lubricant = 30 cP

Calculate the optimum film thickness for minimum power loss.

7. A full journal bearing has the following specifications :

Radial load = 3.2 KN, journal speed 1490 rpm,

journal diameter = 50 mm, bearing length = 50 mm, radial clearance = 0.05 mm, viscosity of lubricant = 25 cP Assume that the total heat generated in the bearing is carried by the total oil flow in the bearing

Find (i) coefficient of friction (ii) power loss in friction (iii) minimum oil film thickness (iv) flow requirement and (v) temperature rise. 10

8. Write short notes on any three : 10

(i) Bearing materials

(ii) Significance of Stricbeck curve in lubrication

(iii) Compensating elements of hydrostatic bearing

(iv) Sommerfeld Number.