Total No. of Questions :10]

SEAT No. : [ ]

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B.E. (Mechanical)

TRIBOLOGY

(End Semester) (Semester - I) (2012 Course) (402044 B)

Time : 2½ Hours] ***[Max. Marks :70***

Instructions to the candidates:

1) ***Write Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Compare sliding and rolling contact bearing in terms of the following: **[6]**

i) Magnitude of load

ii) Starting friction

iii) Nature of the load

iv) Positional accuracy

v) Speed

vi) Noise

b) Define friction and wear. Explain different laws of friction. **[4]**

OR

Q2) a) Define Tribology. Mention minimum five tribological adverse effects generally arises in Industry. **[6]**

b) List the different theories of wear and also list the different friction measuring methods. **[4]**

P.T.O.

Q3) a) Explain four important causes of friction. **[2]**

b) A short hydrodynamic journal bearing refers the following data: **[8]**

Journal speed = 35 revolutions per seconds (rps)

Length of bearing (l) = 0.5 × Journal diameter (d)

Radial clearance (c) = 0.001 × Journal diameter (d)

Eccentricity ratio ($\in$) = 0.65

Flow rate of Lubricant (Qs) = 3.45 litre per hour

Radial Load (W) = 1000 N

Calculate:

i) Journal Diameter

ii) Radial clearance

iii) Dimensions of the bearing

iv) Minimum oil film Thickness

v) Absolute viscosity of the lubricant

OR

Q4) a) What do you mean by abrasive wear and fatigue wear? **[2]**

b) Derive from basic principles two dimensional Reynolds equation taking usual notations. **[8]**

Q5) a) The following data is given for a hydrostatic step bearing. **[8]**

Thrust load = 450 KN

Shaft speed = 750 rpm

Shaft diameter = 400 mm

Recess diameter = 250 mm

Viscosity of lubricant = 30 cP

Specific heat of lubricant = 2 kJ/kg °C

Specific gravity of lubricant = 0.86

Calculate:

i) The optimum oil-film thickness for minimum power loss

ii) The fractional power loss

iii) The pumping power loss and

iv) The temperature rise, assuming the total power loss in bearing is converted into the frictional heat.

b) Explain the phenomenon of squeeze film lubrication. State and Explain any SIX practical examples of squeeze film action. **[8]**

OR

Q6) a) A circular plate of 250 mm diameter is approaching towards a fixed plane surface. Plate and fixed surfaces are separated by an oil film thickness with a viscosity of oil as 150 cP. A load of 15 KN is supported by a film. Calculate the time required for reducing the film thickness from 0.25 to 0.0125 mm. Also approximate square plate of dimensions [D×D] based on the parameters in this problem Where D is side of square plate and is equal to diameter of circular plate. **[8]**

b) Explain in brief the working principle of hydrostatic bearing. State the advantages and limitations of hydrostatic bearing. **[8]**

Q7) a) Explain the phenomenon of Elastohydrodynamic lubrication and state its applications. **[8]**

b) State the Merits, demerits and four applications of gas lubricated bearings. **[8]**

OR

Q8) a) What do you understand by gas lubricated bearings? Compare gas lubricated bearings with oil lubricated bearings based on the following parameters: **[8]**

i) Viscosity of lubricant

ii) Viscous resistance

iii) Frictional power loss

iv) Operating speed

v) Load carrying capacity

vi) Film thickness and surface finish

b) How Elastohydrodynamic lubrication differs from hydrodynamic lubrication? Also Explain the Ertel-Grubin equation with its limitation in brief. **[8]**

Q9) Write a short note on the following: (Any Three) **[18]**

a) Mechanics of tyre road interaction

b) Selection of coatings

c) Porous bearing

d) Foil bearing

OR

Q10)a) Explain the properties and parameters of coatings. **[6]**

b) Explain with neat sketch the Electroplating process. **[6]**

c) Classify the surface engineering processes in detail. **[6]**