R09

Code No: C1506

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH I SEMESTER EXAMINATIONS APRIL/MAY- 2012
TRIBOLOGY
(MACHINE DESIGN)

Time: 3hours **Max.Marks:60**

Answer any five questions
All questions carry equal marks
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1. With the help of a neat sketch explain the construction and working of a capillary viscometer.

2. A pump capable of maintaining 18Mpa pressure is supplying oil of viscosity 70centipoise to a circular hydrostatic bearing of an outside diameter of 0.1m at a rate of $0.4x10^{5}m^{3}/s$, generating a steady film thickness of 35micrometers. The bearing supports a weight of 60KN, and rotates at 1000rpm. Calculate a suitable recess radius and pumping power. Also calculate the percentage in load increase that would cause a 16% decrease in film thickness.

3. A plane slider bearing with fixed shoe is operating under the following conditions.
   i) Width of bearing, B = 45mm
   ii) Length to weight ratio, L/B =1
   iii) Sliding velocity =4m/s
   iv) Minimum film thickness =0.03mm
   v) Absolute viscosity of lubricant =0.02Pa s
   vi) Attitude =2.0
   Neglecting side leakage, find load carrying capacity and coefficient of friction.

4. A steel ball starts rolling from rest down a steel plate inclined at 45^{0} to the horizontal. The plate is covered by a thin oil film of viscosity η = 50 cP and pressure viscosity coefficient $\alpha = 2.2x10^{-8}$ m^{2}/N. The diameter of the ball is $d = 3x10^{-2}m$, Young's modulus is $E = 2.1x10^{11}Pa$, Poisson's ratio is $\upsilon = 0.3$ and density $\rho = 7800$ kg/m^{3}. What is the minimum thickness of the elasto hydrodynamic film after the ball has rolled 1 cm and 1m? Assume no sliding.

5.a) Can a mild steel or equivalent material be used in EHL contacts? Discuss.
   b) Discuss the influence of stress and deformation on elastohydrodynamic lubrication.

6. Derive an average equation for load carying capacity of a partially lubricated surface.

7.a) Abrasive wear has been described as 'wear by a series of miniature cutting tools'. Is this an oversimplification, and, if so, indicate why?
   b) Discuss the effect of sliding speed on friction.

8. Write short note on the following
   a) Surface contaminants
   b) Deep groove radial bearings
   c) Hydrodynamic instability.

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