USN ☐☐☐☐☐☐☐☐☐☐

Eighth Semester B.E. Degree Examination, June/July 2015
Tribology

Time: 3 hrs.   Max. Marks:100

Note: 1. *Answer FIVE full questions, selecting*
at least TWO questions from each part.
2. *Use of machine design data hand book is permitted.*
**3.** *Assume missing data suitably.*

PART – A

1 a. State Hagen-Poiseuille law and derive an expression for velocity distribution across the capillary tube. **(10 Marks)**

   b. Explain with a neat sketch construction and working of Ostwald viscometer and Saybolt viscometer. **(10 Marks)**

2 a. Derive an expression for friction force and coefficient of friction for lightly Loaded Journal bearing stating the assumption. **(10 Marks)**

   b. Explain with a neat sketch Tower's experiment. **(10 Marks)**

3 a. Explain with a neat sketch mechanism of pressure development in an oil film. **(10 Marks)**

   b. The following specification refers to a full journal bearing,
   Journal diameter = 60 mm, Bearing length = 75 mm, Journal speed = 2000 rpm, Radial clearance = 0.04 mm, Viscosity of lubricant = 0.01 PaSec,
   Eccentricity ratio = 0.8,   Inlet pressure = 0.3 MPa, Location of inlet hole = 300°. Determine maximum and minimum pressure and their location. **(10 Marks)**

4 a. Derive an expression for load carrying capacity of an idealized plane slider bearing. **(10 Marks)**

   b. The following data refers to a slider bearing with pivoted shoe:
   Length of the bearing = 500 mm, Width of the bearing = 500 mm, Velocity of runner = 8 m/sec, Oil viscosity = 0.054 PaSec, Maximum and minimum film thickness = 0.15 mm and 0.075 mm. Determine (i) Load that may be carried by the bearing.   (ii) Coefficient of friction   (iii) Power loss. **(10 Marks)**

PART – B

5 a. Explain the importance of oil flow through journal bearing and typical designs of oil grooves in journal bearing. **(10 Marks)**

   b. A partial self contained 120° journal bearing has following specification,
   Journal diameter=87.5 mm, Bearing length=112.5 mm, Speed=480 rpm,
   Load on bearing = 31.78 kN, Diametrial clearance = 0.0875 mm,
   Ambient temperature = 32.2°C, Minimum oil film thickness = 0.013 mm,
   Lubricating oil = SAE40.
   Assuming that entire heat generated in the bearing is dissipated from bearing surface to the surrounding air. Determine i) Expected mean oil film temperature ii) Temperature of the bearing surface with average ventilation iii) Power loss. **(10 Marks)**
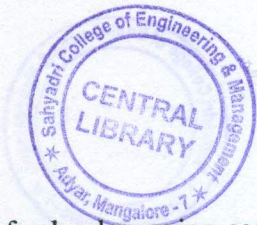
6 a. Derive an expression for load carrying capcity of hydrostatic step bearing. **(10 Marks)**

   b. A hydro static step bearing has following specification:
Shaft diameter = 130 mm, Pocket diameter = 55 mm, Shaft speed = 1800 rpm,
Inlet pressure = 3.75 MPa, External pressure = 0, Expected oil temperature = 50°C
Desirable oil film thickness = 0.00875 mm, Lubricating oil used = SAE60
Determine : i) Load the bearing can support   ii) The rate of flow through bearing
iii) Power loss. **(10 Marks)**

7 a. Mention desirable properties of bearing material and explain any four commonly used bearing materials. **(10 Marks)**

   b. Classify wear. Explain wear of polymer and ceramic materials. **(10 Marks)**

8 a. Explain the three tribological measures to reduce friction and wear. **(10 Marks)**

   b. Explain with graphs the influence of speed, temperature and pressure on wear. **(10 Marks)**

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