

**Eighth Semester B.E. Degree Examination, June/July 2011****Tribology**

Time: 3 hrs.

Max. Marks:100

- Note: 1. Answer FIVE full questions selecting at least TWO questions from each part.**
2. Reference of design data handbook is permitted.

PART – A

- 1 a. Derive Hagen-Poiseuille law. State the assumptions. (12 Marks)
 b. The diameter of a capillary tube connecting two reservoirs is 0.025 cm and its length is 160 cm. The viscosity of oil filling the system is 24.1cp. Determine the difference between pressure in reservoirs A and B if maximum velocity of flow at the centre line of capillary is equal to 8 m/min. (08 Marks)
- 2 a. Derive Petroff's equations for lightly loaded bearings. State the assumptions. (08 Marks)
 b. Determine load carrying capacity, frictional force and power loss due to friction for an ideal full journal bearing having following specifications.
 diameter of journal = 5 cm length of bearing = 6.5 cm
 speed of journal = 1200 rpm radial clearance = 0.0025 cm
 average viscosity = 1.6×10^{-6} Reynolds attitude = 0.8. (06 Marks)
 c. Write a short note on Tower's experiments. (06 Marks)
- 3 Derive Reynold's equation in 2D. State the assumptions. (20 Marks)
- 4 a. Derive an expression for load carrying capacity of a plane slider bearing with fixed shoe. (12 Marks)
 b. A slider bearing with a rectangular pivoted shoe has the following specifications.
 length of shoe in the direction of motion = 75 mm,
 width of shoe = 112 mm,
 velocity of moving member = 200 mm/s,
 viscosity of fluid = 32 cp,
 permissible minimum oil film thickness = 0.0255 mm.
 Assume inclination of bearing corresponding to $q = 1.2$.
 Determine : i) Load carrying capacity
 ii) Power loss in bearing
 iii) Coefficient of friction
 Take into consideration the influence of end leakage on the performance of the bearing. (08 Marks)

PART – B

- 5 a. Write a note on thermal equilibrium of journal bearing. (08 Marks)
 b. An oil ring full journal bearing is to operate in still air. The bearing diameter is 75 mm and length is 75 mm. Bearing is subjected to a load of 5 kN and is rotating at 500 rpm. Radial clearance is 0.0625 mm. The oil is SAE 30 and ambient temperature is 20°C. Determine the equilibrium temperature and viscosity of oil. (12 Marks)

- 6 a. Derive an expression for load carrying capacity of hydrostatic step bearing. State the assumptions. (12 Marks)
- b. A hydrostatic thrust bearing has the following specifications.
vertical thrust = 60 kN,
shaft diameter = 500 mm
pocket diameter = 300 mm,
viscosity = 35 cp,
film thickness = 0.01 mm.
Determine : i) Rate of oil flow through the bearing
ii) Power loss due to viscous friction. (08 Marks)
- 7 a. Write a note on properties of bearing materials. (08 Marks)
- b. Define wear. Name the different types of wear. (04 Marks)
- c. Explain erosive wear with examples. (08 Marks)
- 8 a. Discuss improved selection of materials and surface engineering as the tribological measures in improving tribological behaviour of materials. (10 Marks)
- b. Write short notes on wear of :
i) Polymers
ii) Ceramic materials. (10 Marks)

* * * * *