



Reg. No. : .....

Name : .....

**Eighth Semester B.Tech. Degree Examination, January 2018  
(2013 Scheme)  
13.805.7 : TRIBOLOGY (MPU)**

Time : 3 Hours

Max. Marks : 100

**Instructions :** 1) Use of approved design data book is **permitted**.  
2) Answer **all** questions in Part – A.

**PART – A**

Each question carries 2 marks.

**(2×10=20 Marks)**

1. Sketch kurtosis curves.
2. Define fretting wear.
3. Write continuity equation.
4. Write Hagen-Poiseuille's law.
5. Why viscosity is always measured as kinematic viscosity ?
6. What is the use of restrictors ?
7. Sketch Full and Half Sommerfeld boundary conditions.
8. Distinguish between axial and circumferential grooves in journal bearing with sketches.
9. Define rolling friction.
10. Define bearing area curve.

**PART – B**

Answer **any one full** question from **each** Module in Part B.

**(4×20=80 Marks)**

**MODULE – I**

11. a) How are engineering surfaces characterized ? Explain various statistical Properties of real surfaces. **10**
- b) Derive adhesive wear equation and list the assumptions used. **10**

OR

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12. a) Describe in detail, the eight regimes of wear map of metals. Cite an example to justify its utility. 10
- b) Explain the adhesive theory of sliding friction. 10

## MODULE – II

13. a) State the assumptions and derive expression for flow through rectangular slot. 10
- b) The diameter of a capillary tube connecting two reservoirs is 0.025 cm and its length is 160 cm. The viscosity of the oil filling the system is 24.1 cP. Determine the difference between the pressure in reservoirs A and B if the maximum velocity of flow at the center line of capillary is equal to 8m/min. 10

OR

14. Consider the flow of a laminar incompressible Newtonian fluid flowing between infinitely wide parallel plates separated by distance 'h' and tilted at an angle  $\alpha$ . Assuming that the flow is fully developed, determine the following :
- a) An expression for the fluid velocity profile
- b) Mean flow velocity
- c) Volumetric flow rate
- Plot the velocity profile and the shear stress profile across the gap. 20

## MODULE – III

15. Discuss the construction and working of any four types of viscometers with the help of sketches. 20

OR

16. a) Derive an expression for load carrying capacity of hydrostatic step bearings. State the assumptions. 10
- 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 the rate of oil flow and the power loss. 10



MODULE – IV

17. a) Explain the mechanism of pressure generation in journal bearings with the help of sketches. **10**
- b) Discuss the various operating parameters of the journal bearings. **10**

OR

18. a) 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 SAE30. Determine the equilibrium temperature and viscosity of oil. **10**
- b) The main bearing for a stationary slow speed steam engine has the following data :
- Journal diameter = 20 cm; Maximum load on the piston = 80 kN;  
Engine speed = 200 rpm; Diametric clearance ratio = 0.0009;
- Determine the heat generated and heat dissipated given the operating temperature is 65°C and ambient temperature is 25°C. Take absolute viscosity as  $60 \times 10^{-3}$  PaS, heat capacity =  $11.36 \times 10^{-3}$  KW/m<sup>2</sup>K, length of the bearing =  $\pi$  X diameter of journal ( $L = \pi d$ ). **10**
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