Code No: 07A80304 | R07 | Set No. 2

IV B.Tech II Semester Examinations,APRIL 2011
TRIBOLOGY
Common to Mechanical Engineering, Automobile Engineering

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

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1. Explain basic mechanism of friction with suitable sketches. [16]

2. (a) Can hybrid hydrostatic and hydrodynamic bearings be developed and used to advantage?

   (b) Give examples of operating conditions under which the application of hydrostatic bearings would be necessary or highly desirable. [8+8]

3. With the help of a neat sketch explain the construction and working of capillary viscometer. [16]

4. (a) What are the assumptions proposed by Reynolds in theory of hydrodynamic lubrication?

   (b) Explain the mechanism of load support in hydrodynamic lubrication. [8+8]

5. Design a journal bearing with the following specifications:
   Journal diameter=100mm
   Journal speed=3000rpm
   Radial load=15kN. [16]

6. Classify various bearing materials. [16]

7. A rectangular slider bearing with fixed shoe is operating under the following conditions: Bearing width=80mm
   Bearing length=150mm
   Sliding speed=2.0m/s
   Absolute viscocity of oil=0.02Pa s
   Minimum oil film thickness=0.02mm
   Maximum oil film thickness=0.05mm

   Find:

   (a) The load carrying capacity

   (b) The pressure at a distance 50mm measured from the maximum film thickness point. Neglect side leakage. [16]

8. Give the design aspect of extremely pressurized bearings. [16]

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Code No: 07A80304 | **R07** | **Set No. 4**

IV B.Tech II Semester Examinations,APRIL 2011
TRIBOLOGY
Common to Mechanical Engineering, Automobile Engineering
Time: 3 hours | Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) What is the main difference between hydrodynamic and hydrostatic lubrication?

   (b) Are hydrostatic bearings effective at high sliding speeds? Discuss. [8+8]

2. Explain various oil rings used for bearings. [16]

3. (a) Why is the Michell pad supported on a pivot?

   (b) What level of friction coefficient is attained by a pad bearing? [8+8]

4. (a) What are the laws of friction?

   (b) Differentiate boundary friction with dry friction. [8+8]

5. What other parameters, apart from viscosity, are significant when dealing with lubricants? Explain their role on the effectiveness of the lubricant. [16]

6. Discuss about practical considerations of bearing design. [16]

7. What are the characteristics of Turcite bearing material? [16]

8. Derive an expression for load carrying capacity of hydrodynamic journal bearing stating the assumptions. [16]

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R07

Set No. 1

IV B.Tech II Semester Examinations,APRIL 2011
TRIBOLOGY
Common to Mechanical Engineering, Automobile Engineering
Time: 3 hours   Max Marks: 80
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 efflux viscometer.   [16]

2. Write short note on the following bearing materials:

   (a) Induction hardened steel

   (b) Mild carbon steel.   [16]

3. A shaft 15cm diameter rotates at 1800rpm inside a bearing 15.05cm in diameter and 30cm long. The space is filled with oil of μ=0.018Nsec/m^2. What power is needed to overcome the resistance in bearing?   [16]

4. For the infinitely long Rayleigh step bearing calculate the load and friction per unit length and coefficient of friction. Assume that B_1=0.6B, B_2=0.4B, B=0.2m, h_0=15 μm, height of the step Δh=5 μm, lubricant viscosity is 5×10^{-3}Pas and surface velocity is 10m/s.   [16]

5. Analyze the hydrostatic bearing for load carrying capacity, frictional torque and power loss.   [16]

6. Derive an expression for pressure distribution in hydrostatic bearing.   [16]

7. Explain general dry friction theories in brief.   [16]

8. A circular hydrostatic bearing with an outside diameter of 150mm, recess diameter of 60mm and rotating at 500rpm supports a load of 50kN. The bearing is lubricated by a mineral oil of density 900kg/m^3 delivered to the bearing by a constant flow rate delivery pump operating at 50×10^{-9}m^3/s. The operating temperature of the bearing is 30^{0}C. Calculate the recess pressure and select an SAE oil such that the film thickness will never be less than 10μm.   [16]

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IV B.Tech II Semester Examinations,APRIL 2011
TRIBOLOGY
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Time: 3 hours   Max Marks: 80
Answer any FIVE Questions
All Questions carry equal marks
⋆ ⋆ ⋆ ⋆ ⋆

1. With the help of a neat sketch explain the construction and working of falling sphere viscometer. [16]

2. (a) Discuss the compressibility effect in hydrostatic bearings.

   (b) What are the principles of air bearings? [8+8]

3. Suggest steps for prevention of wear in bearings. [16]

4. Derive an equation for load capacity of a infinitely long journal bearing. [16]

5. (a) What are the classic laws of friction?

   (b) Explain elastic contact in metals. [8+8]

6. Describe typical geometries of non-flat hydrostatic bearings. [16]

7. An infinitely long linear wedge bearing of length L=100mm and width B=20mm is operating under an inlet film thickness of h_0=20 μm. Assuming constant velocity U=10m/s and constant oil viscosity=3.5×10^{-3} Pas find:

   (a) The maximum load the bearing can support

   (b) The non-dimensional load

   (c) The outlet film thickness. [16]

8. What are the characteristics of castable bearing materials? [16]

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