MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PE-ME801E/PE-ME802E Tribology

UPID : 008290

Time Allotted : 3 Hours *Full Marks :70*

The Figures in the margin indicate full marks.
Candidate are required to give their answers in their own words as far as practicable

Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [1 x 10 = 10]

(I) What is the relation between thickness and film thickness?

(II) How to related viscosity with temperature?

(III) What is sub-micro non-homogeneity zone?

(IV) The flash point of lubricant must be ____working temperature.

(V) The statement 'high friction ensures high wear' is _____

(VI) What is bearing modulus as applied to the journal bearing?

(VII) What is thick film bearing is a bearing?

(VIII) In the case of parabolic pressure distribution, what is the average height of the parabola?

(IX) For elasto-hydrodynamic lubrication there should be _____.

(X) What is the thickness of external zone in 3 Zone model of simplified model ?

(XI) As per Archard's wear equation, wear volume in adhesive wear is independent of _____.

(XII) What is bearing characteristic number as applied to the journal bearing?

Group-B (Short Answer Type Question)

Answer any three of the following : [5 x 3 = 15]

2. What are economic aspects of Tribology? [5]
3. What are the various factors affecting wear? [5]
4. Describe different mechanical techniques for manufacturing of surface layer. [5]
5. What are the merits and demerits Gas lubricated bearings? [5]
6. Write down short note on Tilting-Pad Thrust Bearing. [5]

Group-C (Long Answer Type Question)

Answer any three of the following : [15 x 3 = 45]

7. (a) Name different form of surface damage with brief description. [4]
   (b) Name different types of Wear Mechanisms. [4]
   (c) What are different mechanisms of abrasive wear? [3]
   (d) How to calculate abrasive wear is based on the mechanism of micro-cutting? [4]
8. (a) A journal bearing of width 1 m operates with a shaft of 200 mm diameter which rotates at 1200 rpm. The diametral clearance is 200 μm and absolute viscosity of the lubricating oil at am inlet temperature of 20°C is 40 cP. For an eccentricity ratio of 0.7, calculate the minimum film thickness, attitude angle, maximum film pressure, location of maximum film pressure, load capacity, and coefficient of friction. [10]
   (b) Depict the direction of oil flow on the thrust pad bearing. [2]
   (c) How to find average pressure on sector shaped pad pads of thrust bearing? [3]
9. (a) How to strengthening and weakening of the superficial layer? [8]
   (b) What is the effect of properties of superficial layer on fatigue strength? [7]
10. (a) A ball bearing spindle with two radially loaded ball bearings and belt driven at 600 rpm, drives two pumps. The radial load on each bearing is 10 kN. If the basic load capacity of each bearing is 25 kN, calculate the L_{10} life of the system [5]
    (b) Derive pressure distribution, load capacity and time to approach between rectangular plates for Squeeze film lubrication [8]

(c) Why is external source of pressure required for hydrostatic lubrication? [2]

11. (a) A hydrostatic thrust bearing with a circular step pad has an outside diameter of 400 mm and recess diameter of 250 mm. (a) Calculate the recess pressure for a thrust load of 100,000 N; (b) calculate the volumetric flow rate of the oil which will be pumped to maintain the film thickness of 150 μm with an oil viscosity of 30 cP; (c) calculate the film stiffness for an applied load of 100,000 N and operating film thickness of 150 μm; and (d) calculate the pumping loss and the oil temperature rise. The mass density of the oil is 880 kg/m3 and its specific heat is 1.88 J/g K. [8]

(b) What is difference between Infinitely Long-Journal Bearing and Infinitely Short Journal Bearing in governing equation also write down polar form in both cases and Compared the load bearing capacity. [7]

*** END OF PAPER ***