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Paper Code : ME-703C

PUID : 07191 (To be mentioned in the main answer script)

TRIBOLOGY

Time Allotted : 3 Hours | *Full Marks* : 70

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

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$

i) Tribology is branch that deals with study of

a) Friction

b) Wear

c) Water waves breaking against wall

d) Motion of submarine in water.

ii) Bearing service life depends upon

a) Material

b) Surface topograph

c) Hardness

d) All of these.

iii) The key areas of Green tribology represents to
  a) Material improvement
  b) Life cycle improvement
  c) Material properties enhancement
  d) All of these

iv) Bearing capacity of medium series over light series is
  a) 10-20% b) 30-40%
  c) 20-30% d) 40-50%

v) Taper bearing can take
  a) Radial loads only b) Axial loads only
  c) Both (a) and (b) d) None of these.

vi) The Ball bearing are usually made from
  a) Low carbon steel b) Medium carbon steel
  c) High carbon steel d) Chrome nickel steel

vii) Lubricant converts
  a) solid friction into liquid friction
  b) liquid friction into solid friction
  c) both (a) and (b)
  d) none of these

viii) Specific gravity of lubricant can be measured by using
  a) Hydrometer b) Viscometer
  c) Anemometer d) Pyranometer.

ix) The flash point of lubricant must be ..... the working temperature
  a) well below b) well above
  c) equal to d) none of these.

x) The following is not a type of roller contact bearing
  a) Ball bearing b) Journal bearing
  c) Roller bearing d) All of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2 a) Why does stick slip phenomenon occur ?

b) What are similarities and differences between adhesive, abrasive and junction growth friction theories ? 2 + 3

3. a) Enumerate Carbon nanotubes.

b) Why are carbon nanotubes used in coating ? 2 + 3

4 a) Define Wear. State various types of wear.

b) How is 2-body abrasion different from adhesive wear ? 2 + 3

5 a) Explain 'Bath tub Curve'

b) Enumerate the factors that influence most the formation and maintenance of thick oil film in hydrodynamic bearings.

6 a) Define Tribology

b) Write a short note on history of Tribology 1 + 4

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7 a) Explain Stribeck curve with neat sketch.

b) What are the important properties of bearing materials ? Discuss in detail 10 + 5

8 a) Assume a hard ball sliding against a soft and flat surface at two different loads. At one situation coefficient of friction is 0·25 having grove width of 1·8 mm and the situation, having 0·25 and 0·8 mm of coefficient of friction and grove width respectively. Determine the adhesive component of friction coefficient and the radius of ball. Assuming friction due to adhesion and ploughing in additive mode.

b) Explain Greenwood-Williamson model of contact of rough surfaces. State its limitations. 5 + 10

9. Explain in details with neat sketches three different methods available in computing the viscosity of lubricant. 3 × 5

10. a) A full journal bearing of width 100 cm operates with a shaft of 20 cm diameter rotating at 1200 rpm and having diametral clearance of 200 μm. The lubricating oil has an absolute viscosity at an inlet temperature of 20°C is 40 cp. For an eccentricity ratio of 0·7, calculate minimum film thickness, attitude angle, maximum film pressure, its location and load capacity.

b) Explain the interdisciplinary approaches of Tribology. 10 + 5

11. a) With the help of neat sketch diagram explain Hydrodynamics lubrication.

b) Discuss various properties of lubrication. 8 + 7

12. Write short notes on any *three* of the following : 3 × 5

a) Adhesive wear and Abrasive wear

b) Fretting

c) Erosion

d) Atomic force microscope.