Total No. of Questions : 10]

SEAT No. :

P4883

[Total No. of Pages : 2

[5155] - 9
M.E. (Mechanical) (Design Engineering)
INDUSTRIAL TRIBOLOGY
(2008 Pattern) (Elective - IV)

Time :3 hours] *[Max. Marks :100*

Instructions to the candidates:

1) *Attempt three questions from section I and three questions from section II.*
2) *Figures to the right indicate full marks.*

SECTION - I

Q1) a) Discuss various types of friction and Explain Coulomb classical theory of friction. **[8]**

b) Define Tribology. Explain its importance in industry. **[8]**

Q2) a) Derive an expression for load carrying capacity and oil flow rate for hydrodynamic step bearing. State the assumptions made. **[8]**

b) Obtain Petroffs equation for friction coefficient and power lost in lightly loaded bearings. Also state the assumptions made. **[8]**

Q3) a) Explain the term Wear. Explain in detail different types of wear experienced in mechanical systems? Discuss the effect of temperature and load on wear. **[8]**

b) What do you mean by rolling friction and rolling resistance? Explain Tomlinson's theory of molecular attraction. **[8]**

Q4) a) Derive an expression for flow rate through rectangular slot. State the assumptions made. **[8]**

b) What are the advantages and limitations of hydrostatic bearings over hydrodynamic bearings. **[8]**

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Q5) Write a note on following (Any Three) **[18]**

a) Bearing materials

b) Stick-slip Phenomenon

c) Summerfield Number

d) Heat in bearings

SECTION - II

Q6) a) Derive the expression for the pressure distribution , load carrying capacity and time of approach for a circular plate near a plane under hydrostatic squeeze film lubrication. **[8]**

b) State basic requirements of gas lubrication. State the advantages and limitations of gas lubricated bearings. **[8]**

Q7) For Non - Newtonian behavior of lubrication oils explain the following. **[16]**

a) Bingham fluids

b) Thixotropy

c) Pseudo plastic flow

d) Dilitancy

e) Elasticity

Q8) a) Explain mechanics of tyre road interactions. And discuss the rolling friction model. **[8]**

b) Explain tribological aspect of metal workings. **[8]**

Q9) Using modified Reynolds equation for Elasto-hydrodynamic lubrication , derive Ertel Grubin equation. State limitations of this equation. **[16]**

Q10) Write a note on following (Any Three) **[18]**

a) Tilting pad bearings

b) Power losses in Hydrostatic step bearing

c) Piston pin lubrication.

d) Recycling and processing of used oil