Total No. of Questions : 10]

SEAT No. :

P4011

[Total No. of Pages : 3

[4860] - 109

M.E. (Mechanical) (Design Engineering)

INDUSTRIAL TRIBOLOGY

(2008 Pattern) (Elective - IV (b))

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

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Explain the mechanism of adhesive wear. Derive the equation for the law of adhesive wear proposed by Archad. Explain Rowe's modification of Archad equation. **[16]**

Q2) Discuss various types of friction and explain following theories of friction: **[16]**

a) Coulomb's classical theory

b) Tomlinson's theory of molecular attraction

c) Bowden's theory of cold welded junction

Q3) Stating the assumptions used, derive the full Reynolds equation. **[16]**

P.T.O.

Q4) Derive an expression for load carrying capacity and oil flow rate for hydrostatic step bearing. State the assumptions made. Also write principle of working of this bearing and applications. **[16]**

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

a) Instabilities and stic-slip motion.

b) Tribological properties of bearing materials and lubricants.

c) Elasto-Hydrodynamic Lubrication.

d) Foil bearings.

e) Stress distribution in Hertzian contacts.

SECTION - II

Q6) Assuming generalized Reynolds equation, derive Reynolds equation for aerodynamic bearings in dimensionless form. Explain various terms in the equation. State the advantages and limitations of air lubricated bearings. Give their applications. **[16]**

Q7) Using modified Reynolds equation for Elasto-hydrodynamic lubrication, derive Ertel Grubin equation. State limitations of this equation. **[16]**

Q8) a) Obtain an equation for time required for a circular plate to reduce film thickness from h_1 to h_2 while it approaches a fixed plate. **[8]**

b) Explain any six situations where Hydrostatic squeeze film exists. Also give advantages and limitations of squeeze film lubrication. **[8]**

Q9) a) Explain tribological aspect of rolling motion. **[8]**

b) Explain mechanism of tyre-road interaction. **[8]**

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

a) Externally pressurized circular pad step bearing.

b) Porous bearing.

c) Solid lubricants and additives.

d) Tribological aspect of drawing and extrusion.

e) Tribological aspect of wheel on rail contact.

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