

Registration no:

Total Number of Pages: 02

M.TECH
MDPC202

First Semester Examination – 2013

BEARINGS AND LUBRICATION

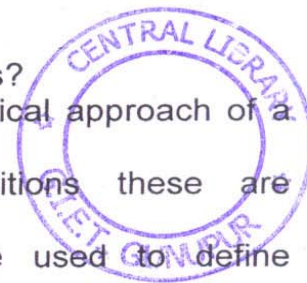
Time: 3 Hours

Max marks: 70

Answer Question No.1 which is compulsory and any five from the rest.

The figures in the right hand margin indicate marks.

- Q1 Answer the following questions: (2 x 10)
- a) Enumerate the factors that form and maintain thick oil film in hydrodynamic journal bearings.
 - b) Write the range of pressure generated in soft and hard elastohydrodynamic lubrication and the corresponding film thickness values?
 - c) State the advantages of hydrostatic bearings over hydrodynamic bearing.
 - d) Explain the mechanism of pressure development in hydrodynamic bearing.
 - e) How laminar and turbulent flows are classified?
 - f) How are the stresses distributed at the contact points?
 - g) What role do boundary conditions play in a numerical approach of a problem?
 - h) What is Hertzian stress? Under what conditions these are encountered?
 - i) What is roughness and which parameters are used to define roughness?
 - j) What is order of magnitude, what role does it play in achieving the solutions in Tribology?
- Q2 a) What is Viscosity Index and what does it convey? What is the influence of pressure, density, temperature on viscosity? (5)
- b) The measured kinematic viscosities at 40 °C and 100 °C of a petroleum product are: $U = 73.30$ and $P = 8.86 \text{ mm}^2/\text{s}$. $L = 119.94$ and $H = 69.48 \text{ mm}^2/\text{s}$, find the viscosity index if L , H , and U correspond to 40 °C whereas P corresponds to 100 °C. (5)
- Q3 a) What is a bearing? State any three function of bearing and give application of sliding and rolling contact bearings? (5)
- b) What types of additives are used in lubricating oils and why? What is the effect of lubrication in I.C. engines? (5)
- Q4 Give various assumptions used in deriving the generalized Reynolds equation and derive a Reynolds equation for a finite journal bearing. (10)
- Q5 a) How performance parameters differ from operating parameters? (5)
- b) With the help of suitable examples give a detailed account of pressure generation due to various terms in generalized Reynolds equation. (5)



- Q6 a) What types of equations are used for mathematical modeling of flow in high-speed bearings? How such solutions are different from normal solutions? (5)
- b) How non adhesive elastic deformation can be estimated by numerical methods? Explain by taking suitable example. (5)
- Q7 a) What is elastohydrodynamic lubrication? What type equations are used for solution of such situations? (3)
- b) What types of equations are used for determination of pressure in cylindrical contacts? Deduce the relations for deformation and pressure distribution under dry contacts. (7)
- Q8 ✓ a) How bearings are classified? What type of failures is commonly encountered in bearings? (2.5)
- b) Explain different lubrication regimes with suitable industrial applications/ examples. (2.5)
- c) What do you mean by additives? Why these are used in lubrication? (2.5)
- d) Explain about the Mechanism of wear. (2.5)