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Total Number of Pages : 02

M.Tech
P2MDCC04

2nd Semester Regular / Back Examination 2018-19
BEARING & LUBRICATION
BRANCH : MACHINE DESIGN, MECH. SYSTEM DESIGN
Max Marks : 100
Time : 3 Hours
Q.CODE : F296

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.

The figures in the right hand margin indicate marks.

Part- I

Q1 Only Short Answer Type Questions (Answer All-10) (2 x 10)

- State the different regime of lubrication?
- Write the momentum equation in two dimension in Cartesian coordinate?
- Name some machine element where boundary layer lubrication is predominant?
- Under what condition fluid film bearings are more susceptible to turbulence?
- What is the significance of turbulent coefficient?
- In elaso-hydrodynamic lubrication (EHL) how the effective Young's modulus is expressed?
- Why applied load in EHL has little effect on the minimum film thickness?
- Show the stress distribution at the point of contact for contact between two spheres?
- Show the variation of film thickness and pressure distribution in EHL?
- Define a bearing?

Part- II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- State the different mechanisms of pressure development in oil film?
- State the assumption made in the derivation of Reynolds' equation?
- Describe the elasto-hydrodynamic lubrication (EHL) and state its merits, demerits and applications?
- What do you mean by singularity effect ? Discuss the different methods to avoid singularity effect?
- State the assumption made in Hertz theory?
- Is there any possibility of squeeze film action in EHL mechanism /? explain
- Discuss how the pressure viscosity term is introduced in the Reynolds' equation?
- State the energy equation and explain the different terms in the energy equation with their significance?
- Give a brief classification of bearing and state the operating conditions under which a fluid film bearings and rolling element bearings are used.
- Discuss the diffent boundary conditions used in the evaluation of film thickness in EHL?
- How the , Numerical simulation of elastic deformation in bearing surfaces is achieved by using finite difference method? Discuss.
- Discuss the different performance parameters in a fluid film bearing?

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Derive the Reynolds's equation in two dimension and explain the different terms therein? **(16)**
- Q4** Derive the expression for maximum pressure during elastic deformation of two contacting solid spheres? **(16)**
- Q5** A ball thrust bearing with 7 balls is loaded with 700N across its races through the balls. Diameter of the speherical balls is 10mm. Assume the load is equally shared by the all balls, and race is aflatsurface($R_2=\infty$). Determine the size of contact patch on the race. Assume poission's ratio as 0.28 and $E=207\text{GPa}$ for ball and race materials. **(16)**
- Q6** Discuss how scalling analysis is applied to the Navier-Stokes equations to obtain order of magnitude estimates for various quantities of physical interest? **(16)**