

MANIPAL INSTITUTE OF TECHNOLOGY MANIPAL

A Constituent Institution of Manipal University

## **II SEMESTER M.TECH. (COMPUTER AIDED ANALYSIS AND DESIGN) END SEMESTER EXAMINATIONS, APRIL 2018**

SUBJECT: LUBRICATION OF BEARINGS [MME 5201]

## **REVISED CREDIT SYSTEM**

Time: 3 Hours

MAX. MARKS: 50

04

04

## **Instructions to Candidates:**

✤ Answer ALL the questions.

✤ Missing data may be suitable assumed.

- **1A.** What are the different lubricant types? Give examples of their application. 03
- **1B.** What are the factors that affect the development of hydrodynamic pressure 03 in a lubricated contact
- 04 **1C.** From first principles derive the continuity equation for a fluid with density  $\rho$ and flowing with velocities u, v, and w along the x, y and z axes respectively.
- **2A.** Write a note on partial journal bearings. What are their advantages and 02 disadvantages.
- 2B. Briefly discuss the long and short bearing solutions for the Reynolds equation. How are real bearings different from the above two models.
- 2C. Using a flow chart explain the procedure for determining the load capacity 04 of a finite bearing using a Finite Difference Approach.
- **3A.** Explain the following geometrical features of a rolling element bearing with 04 neat sketches: a) Diametral clearance b) Race conformity c) Contact angle d) Shoulder height
- **3B.** Derive an expression for the radial load capacity of a ball bearing. 04 02
- **3C.** Write a note on ISO standards for rolling element bearings.
- **4A.** Derive the condition for maximum stiffness of a capillary compensated hydrostatic circular step thrust bearing
- 4B. Show that the condition for minimum power loss in a circular step thrust externally pressurized fluid film bearing is:-

$$\left(\frac{r_0}{r_i}\right) = \frac{1}{4} \left[\frac{r_0^2}{r_i^2} - 1\right]$$
**03**

- **4C.** With a neat sketch explain the FOUR different regimes of EHL lubrication. 03
- **5A.** Write a note on Aerostatic bearings and their stability. 03
- **5B.** Discuss the friction and wear characteristics of lamellar solids. 03
- 5C. Discuss with sketches the traditional methods of solid lubricant deposition. 04