Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

I SEMESTER M.TECH (TRIBOLOGY AND MAINTENANCE) END SEMESTER EXAMINATIONS, NOVEMBER 2018

SUBJECT: LUBRICATION ENGINEERING [MME 5163]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1A. Using the Stribeck curve discuss the following lubrication modes with a neat sketch a)Boundary lubrication b)Hydrodynamic lubrication c) Elasto hydrodynamic lubrication **03**

1B. Define the following physical properties of mineral oils. **04**
1)Viscosity (2) Viscosity Index (3) Fire point (4) Pour point Explain the significance and importance of each of these properties.

1C. With neat sketches explain how hydrodynamic pressure is generated in a converging wedge. What is the significance of cavitation in hydrodynamic bearings **03**

2A. Discuss the constant pressure system of Hydrostatic lubrication. How does it differ from the constant flow system. **03**

2B. Discuss with neat sketches the boundary layer concepts in bearings **03**

2C. Discuss briefly the long and short bearing solutions for the Reynolds equation. How are real bearings different from the above two models **04**

3A. With a neat sketch show the different regimes of elastohydrodynamic lubrication and explain the significance of each regime. **03**

3B. Write a note on Hertzian contact stresses. What is their significance in lubrication? **03**

3C. Explain the steps involved in writing a computer code to solve the Reynolds equation for finite bearings **04**

4A. Derive an expression for the radial load capacity of rolling element bearings. **04**

4B. What are the different numerical approaches to solving elastohydrodynamic lubrication problems. Explain briefly the multigrid method **03**

4C. What are the different functions of a lubricant? What are solid lubricants? **03**

5A. Explain the following with neat sketches with regard to rolling element bearings. 1) Diametral clearance. 2) Inner and outer race conformities as well as total conformity. 3)Endplay **03**

5B. Show that the condition for minimum power loss in a circular step thrust externally pressurized fluid film bearing is:- **04**

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

5C. Write a note on performance evaluation of fluid film bearings **03**