

M.Tech I Semester Supplementary Examinations February/March 2018

**TRIBOLOGY**

(Machine Design)

(For students admitted in 2012, 2013, 2014, 2015 &amp; 2016 only)

Time: 3 hours

Max. Marks: 60

Answer any FIVE questions  
All questions carry equal marks

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- 1 Write explanatory notes on:
  - (a) Wear of ceramic materials.
  - (b) Wear measurements.
  - (c) Advanced material's use in tribology application.
- 2
  - (a) What properties are expected of bearing materials? List them.
  - (b) What is cubic mean load? Explain in detail the procedure involved in preloading of bearings.
  - (c) Write a detailed note on condition monitoring using shock pulse method.
- 3
  - (a) Briefly describe the mechanism of pressure build-up in a hydrodynamic bearing with relevant figures.
  - (b) Derive the Reynold's equation for 3D hydrodynamic lubrication. Also state the assumptions made in this derivation.
- 4
  - (a) Explain the working principle of hydrostatic thrust bearing with figures.
  - (b) A hydrostatic circular thrust bearing has the following data:  
Shaft diameter = 300 mm, Diameter of pocket = 200 mm, Shaft speed = 100 rpm,  
Pressure at the pocket = 500 kN/m<sup>2</sup>, Film thickness = 0.07 mm,  
Viscosity of lubricant = 0.05 PaS.  
Determine: (i) Load carrying capacity. (ii) Oil flow rate. (iii) Power loss due to friction.
- 5 Derive the equations for static load bearing capacity of a rolling element bearing. A ball bearing is operating on work cycle of 3 hours consisting of:
  - (i) A radial load of 3 kN at 1440 r.p.m for one quarter cycle.
  - (ii) A radial load of 5 kN at 720 r.p.m for half cycle.
  - (iii) A radial load of 2.5 kN at 1440 r.p.m for the remaining cycle.The expected life of the bearing is 10000 hours. Calculate the load carrying capacity of the bearing.
- 6
  - (a) What is the role of additive lubrication? What are the additives used in lubricating oils?
  - (b) How rolling bearings are lubricated with grease? Discuss the factors on which the relubrication interval of a roller bearing depends.
- 7
  - (a) Discuss the procedure involved in the selection of mechanical seals.
  - (b) What are the applications of throttling bushes?
- 8 Explain the following:
  - (a) Failure analysis of plain bearings.
  - (b) Wear analysis using ferrography.

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