Exam Date & Time: 30-Nov-2023 (02:30 PM - 05:30 PM)



## **MANIPAL ACADEMY OF HIGHER EDUCATION**

## DEPARTMENT OF MECHANICAL AND INDUSTRIAL ENGINEERING VII SEMESTER B.TECH END SEMESTER EXAMINATIONS, NOV 2023

## Tribology [MME 4044]

Marks: 50 Α Answer all the questions. Section Duration: 180 mins Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed Distinguish and infer the role and significance of following lubricant additives. (a) 1) Contamination Control Additives (b) Pour Point Depressants (c) Wear resistant (4)Additives A) B) Analyze with sketches the different mechanisms involved in a thin lubricant film separating two surfaces under high load and low speed conditions and identify the distinguishable lubrication features offered from metal surfaces under mixed lubrication (3) mode C) Examining the limitations offered by oil lubricated journal bearings in hydropower and marine applications, discuss the need for water lubrication and extent of water lubricated (3)bearing development achieved till date Integrating an axially grooved long journal bearing in a hydraulic turbine application, 2) analyze with sketches the pressure development mechanism involved in the journal (3)bearing from start up to shut down condition A) B) With sketches explain the function of hydrostatic lubrication systems considering constant supply pressure and constant flow conditions. Also, list out the advantages and (4)disadvantages of hydrostatic bearings C) In a tapered roller bearing under oil lubrication conditions, explain the EHL pressure generation mechanism involved with detailed representation of the functional regions of (3)EHL contact Illustrate with neat sketches, the three types of wear determination by profilometry 3) (5)A) Interpret any three friction theories by highlighting its significance and limitations B) (3)C) Explain the surface fatigue wear mechanism based on a specific application

**Duration: 180 mins.** 

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4)	Explain the following surface engineering techniques utilized to develop coatings or superficial layers (a) Static burnishing (b) Dynamic burnishing (c) Plating (d) Melt Surfacing (e) High velocity oxy-fuel coating	(5)
A)		
B)	With suitable sketches, interpret a five-zone model of a superficial layer obtained as a result of machining	(3)
C)	Explain any four of the critical mechanical properties which needs to be improved for a surface engineered material	(2)
5)	With sketches explain in detail the three different EHL film thickness measurement methods utilized in tribometers	(5)
A)		
B)	With schematic illustration detail the operating principles involved in Atomic Force Microscopy of semiconductor materials	(3)
C)	Discuss any four of the rolling element bearing failures and analyze its causes and cures	(2)

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