

THE KAVERY ENGINEERING COLLEGE
(An Autonomous Institution)

M.E DEGREE END SEMESTER THEORY EXAMINATIONS, NOV /DEC 2024

First Semester

Product Design and Development

PPDE2401 / ED4080- Tribology in Design

Data book can be permitted

Regulations – 2021 & 2024

Duration : 3 Hrs

Maximum : 100 Marks

PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)

<i>Q.No</i>	<i>Questions</i>	<i>BLT</i>	<i>CO</i>	<i>Marks</i>
1.	Indicate the four laws of friction.	RE	1	2
2.	Compare static and rolling friction.	UN	1	2
3.	Differentiate fatigue and fretting wear.	UN	2	2
4.	Identify any two coating techniques depends on vacuum or gas at very low pressure.	AP	2	2
5.	Infer is the viscosity of low Viscosity Index (VI) oils less sensitive to temperature than high VI oils? Justify.	AN	3	2
6.	Recall the term gas lubrication.	RE	3	2
7.	Indicate the two conditions for the occurrence of hydrodynamic lubrication.	RE	4	2
8.	State squeeze film effect in hydrostatic thrust bearing.	UN	4	2
9.	Recall the assumptions made on Hertz's theory in elasto hydrodynamic lubrication.	RE	5	2
10.	Indicate the type of regime involved in roller bearings.	AP	5	2

PART – B (ANSWER ALL QUESTIONS) (Marks 5*13 = 65)

<i>Q.No</i>	<i>Questions</i>	<i>BLT</i>	<i>CO</i>	<i>Marks</i>
11.	a Discuss about the various measurements of surface roughness.	AP	1	13
	Or			
	b Discuss about the mechanism occurs during sliding friction: i. Adhesion (10) ii. Grain boundary effects (3)	AP	1	13
12.	a Define abrasive wear and explain the mechanism of abrasive wear with suitable sketch.	AN	2	13
	Or			
	b Explain the friction and wear characteristics of any two metallic and non-metallic materials with suitable sketch.	AN	2	13
13.	a Discuss the suitable physical, and thermal and properties of a lubricants for food and processing industry.	UN	3	13
	Or			
	b Illustrate a neat sketch of the stribeck curve, detailing various types of lubrication.	UN	3	13

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|-----|---|--|----|---|----|
| 14. | a | Derive the Reynold's equation in one dimension stating the various assumption used for deriving the same? | EV | 4 | 13 |
| | | Or | | | |
| | b | A journal bearing 50 mm in diameter and 50 mm long with a diameter clearance of 50 microns is loaded with 20 kN on a shaft rotating at 2400 rpm. If the minimum film thickness is to 10 microns and oil enters with a temperature 50°C, find the effective temperature of oil film and recommend an appropriate SAE grade of oil. Determine the power loss and oil flow? | EV | 4 | 13 |
| 15. | a | Demonstrate the EHL theory, including the differences between soft and hard EHL. | UN | 5 | 13 |
| | | Or | | | |
| | b | Illustrate the stresses and deflections in rolling bearings under EHL conditions, discussing their significance in bearing design and durability. | UN | 5 | 13 |

*PART - C (Marks 1*15 = 15)*

<i>Q.No</i>		<i>Questions</i>	<i>BLT</i>	<i>CO</i>	<i>Marks</i>
16.	a	A gear system operates under high load and fluctuating temperatures. Propose a lubrication method that would optimize performance in these extreme conditions and describe how it prevents overheating and excessive friction.	AP	1	15
		Or			
	b	Compare hydrostatic and hydrodynamic lubrication for use in heavy machinery applications, focusing on load-carrying capacity and energy efficiency. Justify which type would perform better under low-speed, high-load conditions.	AP	4	15