Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. /B. Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, APR / MAY 2024

MECHANICAL ENGINEERING, MATERIALS SCIENCE AND ENGINEERING
SIXTH SEMESTER
ME5084 SURFACE ENGINEERING TRIBOLOGY
(Regulation 2019)

Time:3 hrs | Max. Marks: 100

CO1	Describe the fundamentals of surface features and different types of friction associated with metals and nonmetals.
CO2	Analyze the different types of wear mechanism and its standard measurement.
CO3	Analyze the different types of corrosion and its preventive measures.
CO4	Analyze the different types of surface properties and surface modification techniques.
CO5	Analyze the various types of materials used in the friction and wear applications.

BL – Bloom's Taxonomy Levels
(L1-Remembering, L2-Understanding, L3-Applying, L4-Analysing, L5-Evaluating, L6-Creating)

PART- A (10x2=20Marks)
(Answer all Questions)

Q. No.	Questions	Marks	CO	BL
1	Draw a schematic illustration of a cross section of the surface structure of a metal and label the various regions.	2	1	2
2	Give examples where friction is beneficial.	2	1	1
3	List the types of wear.	2	2	2
4	On the basis of your own experience, make a list of parts and components that have to be replaced because of wear.	2	2	2
5	How do you express the corrosion rate?	2	3	2
6	Define rate of corrosion attack.	2	3	1
7	Why multilayering in coating is required?	2	4	2
8	Name four materials widely used as ingredients of hard coatings.	2	4	2
9	Why graphite and molybdenum disulfide are effective solid lubricants.	2	5	2
10	Compare low friction and high friction materials.	2	5	1

PART- B (5x 13 = 65Marks)

Q. No.	Questions	Marks	CO	BL
11 (a)	How do surface roughness influence the functionality of engineering components, and Explain the various surface roughness parameters in detail with neat illustrations.	13	1	3
	OR			
11 (b) (i)	How do Stick–Slip Motion and Friction Instabilities manifest in engineering systems, and what are the underlying mechanisms causing these phenomena?	8	1	3
(ii)	Explain the effect of various operating conditions on the frictional behavior of materials.	5	1	3
12 (a)	Explain the various types of abrasive wear in detail. Also, mention the ways to prevent it in engineering applications.	13	2	3
	OR			

12 (b)	Explain adhesive wear in engineering components and derive the expression for total wear volume.	**13**	2	3
13 (a)	Compare and contrast the mechanisms, characteristics, and potential impacts on materials of pitting corrosion, crevice corrosion, erosion corrosion and galvanic corrosion. Also mention the real-world examples of each type of corrosion.	**13**	3	3
	OR			
13 (b)	Explain about the following corrosion control methods in detail. (i) Cathodic Protection (ii) Sacrificial coatings (iii) Inhibitors	**13**	3	3
14 (a)	Explain the types of thermal spraying with neat illustrations.	**13**	4	3
	OR			
14 (b)	Discuss the variants of physical vapour deposition techniques with neat sketches.	**13**	4	3
15 (a)	Explain the tribological and corrosion behavior of two metallic materials commonly used in orthopedic implants and medical devices.	**13**	5	4
	OR			
15 (b)	Explain in detail the tribological characteristics of ceramics, including their advantages, limitations, and typical applications.	**13**	5	4

PART- C (1x 15=15Marks)
(Q.No.16 is compulsory)

Q. No.	Questions	Marks	CO	BL
16. (i)	Analyze the wear characteristics of a specific engineering component or tribo-pair, detailing influencing factors, wear mechanisms, and mitigation strategies.	**7**	2	5
(ii)	Analyze how design influences corrosion of engineering components and explain steps in corrosion-control design.	**8**	3	5