

Reg. No. :

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Question Paper Code : 81013

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2025.

Fifth/Sixth/Seventh/Eighth Semester

Mechanical Engineering

CME 397 – SURFACE ENGINEERING

(Common to : Manufacturing Engineering)

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Write the consequence of inaccurate friction data in system modeling.
2. How would you relate surface roughness to friction in a mechanical system?
3. What is surface hardness?
4. Differentiate between abrasive and adhesive wear.
5. Compare the effectiveness of inhibitors and material selection in corrosion control.
6. How to prevent galvanic corrosion?
7. What is a super hydrophobic surface?
8. State the role of nano-coatings in improving surface hardness.
9. Mention any four properties that make ceramic materials effective in friction-reducing applications.
10. Name any two biomaterials used in dental implants.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Explain the significance of surface roughness in tribological performance. (7)
- (ii) Analyze the causes and effects of the stick-slip phenomenon. (6)

Or

- (b) (i) Describe the process of surface measurement and its industrial importance. (7)
- (ii) Illustrate how friction properties vary between metals and non-metals. (6)

12. (a) Explain the various types of wear mechanisms such as adhesive, abrasive, and erosive wear. Use neat diagrams and real-world examples to compare their characteristics.

Or

- (b) Analyze wear debris analysis as a tool for failure prediction. Explain its importance, methods used, and how it helps in condition monitoring.

13. (a) Discuss in detail on the corrosion control strategies in critical industries. Give examples from marine, oil and gas processing sectors.

Or

- (b) (i) Summarized the cathodic and anodic protection methods used for corrosion control. (7)

- (ii) Differentiate between accelerated corrosion testing and simulated service testing. Explain their methodologies. (6)

14. (a) Describe the role of corrosion-resistant coatings in surface engineering. Explain the criteria for selecting these coatings for harsh environments.

Or

- (b) Discuss surface metallurgy and its impact on surface properties. Explain how different treatments modify hardness and wear resistance.

15. (a) Explain the tribological properties of biomaterials used in medical implants. Include examples such as UHMWPE and bio-ceramics.

Or

- (b) Describe the selection of materials for high-temperature and corrosive environments. Mention a comparison matrix for at least four material types.

PART C — (1 × 15 = 15 marks)

16. (a) A polymer bearing used in food processing machines deforms and fails due to frictional heat. Analyze the failure and recommend a suitable material upgrade.

Or

- (b) A precision gearbox is experiencing increased friction and noise. Analyze possible surface-related causes and propose engineering solutions to reduce friction.