



B.E/B.TECH DEGREE EXAMINATIONS: NOV/DEC 2024

(Regulation 2018)

Sixth Semester

MECHANICAL ENGINEERING

U18MET6005: Applied Materials Engineering

COURSE OUTCOMES

- CO1:** Apply the knowledge on metal structure crystallization and plastic deform.
CO2: Apply the knowledge on the various phase diagrams and their applications.
CO3: Apply the knowledge of failure mechanisms in failure analysis of metallic materials.
CO4: Apply the students will acquire knowledge on Fe-Fe₃C phase diagram, various microstructures, and alloys.
CO5: Apply the students will get knowledge on mechanical properties of materials and their measurement.
CO6: Explain properties, structure and applications of composites, ceramics and nanomaterial's.

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 2 = 20 Marks)

(Answer not more than 40 words)

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|--|-----------------------|
| 1. Define unit cell. | CO1 [K ₁] |
| 2. Write in short about slip and twinning. | CO1 [K ₁] |
| 3. List out the applications of phase diagrams. | CO2 [K ₂] |
| 4. Infer "eutectoid reaction". | CO2 [K ₂] |
| 5. Compare ductile and brittle fracture. | CO3 [K ₂] |
| 6. Define fatigue and creep. | CO3 [K ₁] |
| 7. Recall the terms "ferrite" and "austenite" in iron – carbon alloy system. | CO4 [K ₁] |
| 8. Outline about the Fick's laws | CO4 [K ₂] |
| 9. List out the properties of maraging steel. | CO5 [K ₁] |
| 10. Compare thermoplastics and thermosetting plastics. | CO6 [K ₂] |

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

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|-----|----|--|----|-----|-------------------|
| 11. | a) | Draw a neat sketch of FCC crystal structure and find its packing factor, coordinate number. | 08 | CO1 | [K ₂] |
| | b) | Explain the effect of grain boundaries on the properties of alloys, also determine the grain size. | 08 | CO1 | [K ₂] |
| 12. | a) | State the Gibb's phase rule and explain the various types of phase diagrams with suitable sketches. | 16 | CO2 | [K ₂] |
| 13. | a) | Construct the Fe-Fe ₃ C diagram and discuss the relationship between the iron and wt % of carbon content and label all the points, lines and areas. | 16 | CO4 | [K ₃] |
| 14. | a) | Illustrate about S-N curve and show the fatigue behavior of materials, and what information does it provide regarding the material's endurance limit and fatigue life? | 16 | CO3 | [K ₃] |
| 15. | a) | Draw the TTT diagram for eutectoid steel and explain various features of the same. | 16 | CO5 | [K ₂] |
| 16. | a) | Discuss the properties and engineering application of the following engineering ceramics,
(i) WC and TiC,
(ii) TaC and CBN | 16 | CO6 | [K ₃] |
