

Reg. No.

Question Paper Code

13677

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2025

Third Semester

Mechanical Engineering

20MEPC303 - ENGINEERING METALLURGY

Regulations - 2020

Duration: 3 Hours

Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

- | | Marks | K-Level | CO |
|---|-------|---------|-----|
| 1. Select the value of Peritectic temperature from the following values.
(a) 727 °C (b) 758 °C (c) 1148 °C (d) 1495 °C | 1 | K1 | CO1 |
| 2. Which is the most tough among the steels given their carbon composition?
(a) 0.1 % (b) 0.25 % (c) 0.3 % (d) 0.88 % | 1 | K1 | CO1 |
| 3. Heat treatment of metal is necessary
(a) To produce certain desired properties
(b) To make good appearance on the component
(c) To increase strength of the metal
(d) To make the metal rust proof | 1 | K1 | CO2 |
| 4. During normalizing process, steel is cooled
(a) In still air to room temperature (b) In oil (c) By forced air (d) In water | 1 | K1 | CO2 |
| 5. Precipitation hardening is also known as _____.
(a) Age hardening (b) Dispersion hardening
(c) Grain boundary strengthening (d) Strain hardening | 1 | K1 | CO3 |
| 6. Dispersion hardening is a type of _____.
(a) Second phase particle strengthening (b) Strain hardening
(c) Solid solution hardening (d) Precipitation hardening | 1 | K1 | CO3 |
| 7. Steels containing up to 3% to 4% of one or more alloying elements are known as _____.
(a) Low alloy steels (b) HSLA steels (c) High alloy steels (d) Stainless steels | 1 | K1 | CO4 |
| 8. The carbon content in steel is
(a) Up to 2% (b) Above 2% (c) Below 0.8% (d) Above 6.3% | 1 | K1 | CO4 |
| 9. Natural rubber is a polymer of
(a) Butadiene (b) Ethyne (c) Styrene (d) Isoprene | 1 | K1 | CO5 |
| 10. Engineering stress-strain curve and True stress-strain curve are equal up to
(a) Proportional limit (b) Elastic limit (c) Yield point (d) Tensile strength point | 1 | K1 | CO6 |

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

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| 11. Differentiate between substitutional and interstitial solid solution. | 2 | K2 | CO1 |
| 12. State Gibb's phase rule. | 2 | K1 | CO1 |
| 13. The tempering process follows the hardening process. Justify. | 2 | K2 | CO2 |
| 14. Differentiate between flame hardening and induction hardening process. | 2 | K2 | CO2 |
| 15. Brief down the concept of over ageing. | 2 | K2 | CO3 |
| 16. Which property decreases on strain hardening? Explain the same. | 2 | K2 | CO3 |
| 17. List few alloying elements in steel. | 2 | K1 | CO4 |
| 18. State the effects of addition of boron, chromium and cobalt in steels. | 2 | K1 | CO4 |
| 19. Define the term 'degree of polymerisation'. | 2 | K1 | CO5 |
| 20. "Composite Materials are considered as anisotropic material" – Justify. | 2 | K2 | CO5 |

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| 21. Distinguish between resilience and toughness. | 2 | K2 | CO6 |
| 22. How can brittle fracture be prevented? | 2 | K1 | CO6 |

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

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| 23. a) | Explain with a neat sketch of Iron-Iron carbide equilibrium diagram and indicate all the phases. Also write the three important invariant reactions. | 11 | K2 | CO1 |
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| b) | Discuss the classification, properties, and application of steel. | 11 | K2 | CO1 |
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| 24. a) | Explain the TTT diagram with a neat sketch with all the phases marked on the diagram. | 11 | K2 | CO2 |
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| b) | Explain the principle and procedure of Jominy end quench test with a diagram. Also sketch the graph hardness vs distance from quenched end. | 11 | K2 | CO2 |
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| 25. a) | In detail explain the concept of solid solution strengthening. Provide examples to substantiate the explanation. | 11 | K2 | CO3 |
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| b) | Explain the concept and principle of particulate strengthening in detail. | 11 | K2 | CO3 |
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| 26. a) | Discuss the properties and applications of cu alloys and aluminium alloys. | 11 | K2 | CO4 |
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| b) | Discuss the properties and applications of | | | |
| | i) Tool Steels | 6 | K2 | CO4 |
| | ii) HSLA | 5 | K2 | CO4 |

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| 27. a) | Write brief notes on following traditional ceramics | | | |
| | i) Clay products ii) Glasses iii) Cements iv) Refractories | 11 | K2 | CO5 |

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| b) | With relevant examples, explain the various types of polymers in detail. | 11 | K2 | CO5 |
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| 28. a) | Explain the method of testing the materials for fatigue and how is the fatigue data presented. | 11 | K2 | CO6 |
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| b) | Compare and contrast the Brinell, Vickers and Rockwell hardness tests. | 11 | K2 | CO6 |
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