



B.E DEGREE EXAMINATIONS: NOV/DEC 2022

(Regulation 2018)

Third Semester

AUTOMOBILE ENGINEERING

U18AUT3004 - Materials and Metallurgy

COURSE OUTCOMES

- CO1: Compare and explain materials based on structure and properties**
CO2: Infer the state and composition of material through phase diagram
CO3: Explain the mechanism of deformation in materials
CO4: Explain the various testing method of material Properties
CO5: Select the suitable treatment processes for the engineering material.
CO6: Survey and report the material used in automotive sector

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. Differentiate Cast iron and Steel. | CO1 | [K ₂] |
| 2. calculate atomic packing factor for Austenite iron by drawing its crystal structure. | CO1 | [K ₃] |
| 3. State Gibbs Phase rule | CO2 | [K ₁] |
| 4. Draw cooling curve of iron and list out its allotropy. | CO2 | [K ₂] |
| 5. Using stress strain plot explain elastic and plastic deformation. | CO3 | [K ₂] |
| 6. Compare elasticity and elastic limit property of steel and rubber material | CO3 | [K ₂] |
| 7. Mention the mechanical test used to determine hardness and hardenability property of a material. | CO4 | [K ₂] |
| 8. Explain the need for heat treating a material. | CO5 | [K ₂] |
| 9. Define Quenching. | CO5 | [K ₂] |
| 10. List out few materials that can be used for manufacturing Engine block of the vehicle | CO6 | [K ₂] |

Answer any FIVE Questions: -

PART B (5 x 4 = 20 Marks)

(Answer not more than 80 words)

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|---|-----|-------------------|
| 11. List out different internal structure formed in Iron carbon alloy system. | CO2 | [K ₂] |
| 12. Compare the following material properties of rubber and steel | CO1 | [K ₄] |

- i) Elastic limit
- ii) Elasticity
- iii) Resilience

- | | | |
|---|-----|-------------------|
| 13. Explain the process involved construction of an isomorphous phase diagram | CO2 | [K ₂] |
| 14. With neat sketch discuss about Brinell hardness test | CO4 | [K ₂] |
| 15. Brief principle of Strain hardening with required diagram. | CO3 | [K ₂] |
| 16. Discuss about stages in quenching | CO5 | [K ₂] |

**Answer any FIVE Questions:-
PART C (5 x 12 = 60 Marks)
(Answer not more than 300 words)**

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|---|-----|-------------------|
| 17. Draw stress strain curve and explain the different mechanical properties of a material | CO1 | [K ₂] |
| 18. Draw Iron Iron carbide equilibrium diagram and explain the various invariant reactions occurring in the phase diagram | CO2 | [K ₂] |
| 19. Explain the normalizing process for hypo eutectoid and hyper eutectoid steels with required diagram | CO5 | [K ₂] |
| 20. With neat sketch explain Jominy end quench Test | CO4 | [K ₂] |
| 21. Explain in detail about Plastic deformation & discuss the mechanism of slip & twinning with a neat sketch. | CO3 | [K ₂] |
| 22. List out at least 20 automobile components and material used to manufacture with its properties | CO6 | [K ₂] |
