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Question Paper Code: U2704

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2024

Second Semester

Mechanical Engineering

21UME204 - ENGINEERING MATERIALS AND METALLURGY

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

- Alloys containing 2.0-6.7% carbon are considered as _____ CO1-U
(a) Steel (b) Cast-iron (c) Aluminum (d) Brass
- A mixture of austenite and cementite is called _____ CO1-U
(a) Ferrite (b) Ledeburite (c) Pearlite (d) Bainite
- Full annealing is applied to which kind of materials? CO1-U
(a) Steel castings (b) Steel wires (c) High carbon steels (d) Sheet products
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(a) Steel castings (b) Steel wires (c) High carbon steels (d) Sheet products
- Tensile test can be performed on CO1-U
(a) Impact testing machine (b) universal testing machine
(c) Rockwell tester (d) Brinell tester
- What is the angle of indenter in Vicker's hardness test? CO1-U
(a) 96 degrees (b) 110 degrees (c) 136 degrees (d) 150 degrees
- Corrosion resistance of an alloy steel can be improved by adding _____ CO1-U
(a) Tungsten (b) Vanadium (c) Chromium (d) Titanium
- Which of the following induces fine grain distribution in alloy steel? CO1-U
(a) Nickel (b) Vanadium (c) Manganese (d) Titanium

9. Natural polymer is CO1-U
 (a) Glucose (b) Teflon (c) PVC (d) Polyamide
10. Computer CD is made from CO1-U
 (a) Polyethylene (b) PVC (c) Polyester (d) Polycarbonate

PART – B (5 x 2= 10Marks)

11. Explain ferrite and cementite in Fe-C alloys. CO1-U
12. Define Quenching. CO1-U
13. Define endurance limit in fatigue test. CO1-U
14. Explain HSLA steels. CO1-U
15. Explain the term polymer? CO1-U

PART – C (5 x 16= 80Marks)

16. (a) Construct Fe-C phase diagram and label all the phases. Discuss the structural transformation while cooling from liquid to solid. CO1-U (16)
 Or
 (b) Distinguish Iron-Iron carbide diagram and explain eutectic, peritectic, eutectoid and peritectoid reaction CO1-U (16)
17. (a) Illustrate the process details of full annealing and spheroidising treatments for steels. Explain the microstructure and need for these treatments. CO2-U (16)
 Or
 (b) Choose suitable case hardening process for automobile engine components and explain the tempering and induction hardening processes. CO2-U (16)
18. (a) Explain the testing procedure for Vickers hardness test and mention the advantages and limitations. CO3-U (16)
 Or
 (b) Explain the mechanism of plastic deformation of metals by slip and twinning? CO3-U (16)

19. (a) Write an engineering brief (composition, heat treatment, properties) about the following steels: [a] Tool steel [b] HSLA steel [c] Maraging steels [d] Spring Steel [e] TRIP steel
CO4-U (16)
- Or
- (b) Discuss the composition, properties, application of aluminium base alloys.
CO4-U (16)
20. (a) Discuss about the manufacturing methods for fibre reinforced plastics(FRP)?
CO5-U (16)
- Or
- (b) Discuss the properties and application of the following polymeric materials PMMA,ABS,PPO and PVC polymers.
CO5-U (16)

