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**Reg. No. :**

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**Question Paper Code: U2704**

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2023

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
- How is cooling of the material done in normalising process? CO1-U  
(a) Furnace (b) Cooling (c) Still air (d) Liquid chamber
- Full annealing is applied to which kind of materials? CO1-U  
(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 equilibrium diagram. CO1-U
12. Explain the term heat treatment. CO1-U
13. Explain the purpose of conducting an impact test? CO1-U
14. Explain HSLA steels. CO1-U
15. Explain the term polymer? CO1-U

PART – C (5 x 16= 80Marks)

16. (a) Classify Iron-Iron carbide diagram and compare cast iron and steel and also distinguish cementite, ferrite and pearlite. CO1-U (16)  
 Or  
 (b) Distinguish the solid solution and compare substitutional and interstitial solid solution. 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) Categorize and compare the various methods used in impact testing machine for find out the impact energy. CO3-U (16)  
 Or  
 (b) Develop a typical creep curve and explain the various stages of creep. Describe the testing procedure for creep with a neat diagram, highlighting the key components and measurements involved. CO3-U (16)

19. (a) Enumerate the composition and applications of following alloys CO4-U (16)  
(i) Cupronickel (ii) Bronze (iii) Brass Alloy  
Or  
(b) Discuss the composition, properties, application of aluminium CO4-U (16)  
base alloys.
20. (a) Explain the polymerization and its various types of polymers, CO5-U (16)  
properties of polymers.  
Or  
(b) Discuss about the manufacturing methods for fibre reinforced CO5-U (16)  
plastics (FRP)?

