A **Reg. No. :** | | | | | | | | | | | | |

Question Paper Code: R2704

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

First Semester

Mechanical Engineering

R21UME204 - ENGINEERING MATERIALS AND METALLURGY

(Regulations R2021)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. First material known to be used by man ____ CO1-U

   (a) Cotton (b) Bronze (c) Iron (d) Rock

2. A mixture of austenite and cementite is called _____ CO1-U

   (a) Ferrite (b) Ledeburite (c) Pearlite (d) Bainite

3. How is cooling of the material is done in the normalizing process? CO1-U

   (a) Furnace (b) Cooling (c) Still air (d) Liquid chamber

4. Flame hardening can only be performed on steels with a minimum of _____ carbon. CO1-U

   (a) 0.4% (b) 0.8% (c) 1.2% (d) 1.8%

5. Tensile test can be performed on CO1-U

   (a) Impact testing machine (b) Universal testing machine

   (c) Rockwell tester (d) Brinell tester

6. Which materials are to be tested using an F-scale? CO1-U

   (a) Copper and brass (b) Case hardened steels

   (c) Bronze, gunmetal, and beryllium copper (d) Thermoplastics

7. Wear resistance of an alloy steel can be improved by adding _____ CO1-U

   (a) Tungsten (b) Vanadium (c) Manganese (d) Titanium

8. What kind of steel requires definite amounts of other alloying elements? CO1-U

(a) Carbon steel (b) Alloying steel (c) Stainless steel (d) Tool steel

9. A polymer having rubber-like properties is known as _____ CO1-U

(a) Thermoset (b) Thermoplastic (c) Elastomer (d) Polyisoprene

10. Alumina is a CO1-U

(a) ceramic (b) Ferrous metal (c) Non-ferrous (d) alloy

PART – B (5 x 2= 10Marks)

11. Illustrate Gibb's phase rule. CO1-U

12. Distinguish carburizing and Nitriding process. CO1-U

13. Explain any four properties of tensile test. CO1-U

14. State three reasons why ferrous alloys are used extensively. CO1-U

15. Classify any four properties of ceramics? CO1-U

PART – C (5 x 16= 80Marks)

16. (a) Explain with a neat labeled phase diagram for the water system, along with an explanation of its various components and application. CO1-U (16)

Or

(b) Describe with the aid of a diagram for the Substitutional and interstitial solid solution. CO1-U (16)

17. (a) Sketch the engineering stress-strain curves for mild steel, aluminum, and cast iron. Discuss the tensile test procedure and explain the different mechanical properties obtained from tensile testing. CO2-U (16)

Or

(b) Construct a neat sketch of the TTT diagram for eutectoid steel and label the regions. Mark the difference products formed on this diagram. CO2-U (16)

18. (a) Explain the Izod test and charpy test to determine the impact strength of a material. CO1-U (16)

Or

(b) Explain the testing procedure for Rockwellhardness test with neat sketch and mention the advantages and limitations. CO1-U (16)

19.	(a)	Classify steel based on their composition and microstructure. Compare their properties and highlight their respective applications.	CO2-U	(16)
		Or		
	(b)	Classify cast iron based on their composition and microstructure. Compare their properties and highlight their respective applications.	CO2-U	(16)
20.	(a)	Explain the properties and applications of the following polymers and discuss anyone fabrication methods of polymers. (I) PMMA (II) PP (III) ABS and (IV) PET.	CO1-U	(16)
		Or		
	(b)	Discuss about the manufacturing methods for fibre reinforced plastics (FRP)?	CO1-U	(16)