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**Question Paper Code: 45702**

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2018

Fifth Semester

Mechanical Engineering

14UME502 - ENGINEERING MATERIALS AND METALLURGY

(Regulation 2014)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

- The number of Bravais space lattices with two lattice points are  
(a) 2                      (b) 3                      (c) 4                      (d) 5
- Eutectic reaction for iron carbon system occurs at  
(a) 600<sup>0</sup> C              (b) 723<sup>0</sup> C              (c) 1147<sup>0</sup> C              (d) 1493<sup>0</sup> C
- Hardness of steel is greatly improved with  
(a) Annealing            (b) Cyaniding            (c) Normalising            (d) Tempering
- Which one of the following mediums is used for fastest cooling rate of steel quenching  
(a) Air                      (b) Oil                      (c) Water                      (d) Brin
- The hardness number 1 on Moh's scale is assigned to  
(a) quartz                  (b) talc                      (c) topaz                      (d) diamond
- The impact strength of a material is an index of its  
(a) hardness                      (b) Resilience to corrosion  
(c) Toughness                      (d) Resilience to failure under reversal of stresses

7. The percentage of carbon in cast iron usually varies between
- (a) 0.1 to 0.2 %                                      (b) 0.5 to 1.0 %  
 (c) 1.0 to 1.5 %                                      (d) 2.5 to 3.5 %
8. Aero plane and certain automobile parts are usually made of
- (a) Magnalium                                               (b) Aluminium bronze  
 (c) Duralumin                                               (d) German silver
9. Structure of a polymer is
- (a) Long Chain                                           (b) Rhombic  
 (c) Cubic                                                   (d) Closed pack hexagonal
10. Polymethyl Methacrylate (PMMA) is known as
- (a) Perspex                                               (b) Teflon                                               (c) Bakelite                                               (d) Nylon 6

PART - B (5 x 2 = 10 Marks)

11. Explain GIBB's phase rule.
12. What is meant by case hardening?
13. Define yield strength.
14. How to classify stainless steel materials?
15. Differentiate thermoplastics and thermosetting plastics.

PART - C (5 x 16 = 80 Marks)

16. (a) With suitable example, draw and explain the phase diagram for a binary alloy of two metals, which are completely soluble in liquid phase but only partly soluble in solid phase. (16)

Or

- (b) Draw and explain various points in iron-carbide equilibrium diagram. List the compositions and typical applications of steels. (16)

17. (a) Compare and contrast the process of full annealing, process annealing, stress relief annealing, recrystallization annealing and spheroidizes annealing. (16)

Or

(b) Define the term hardenability of steels. Explain Jominy end quench test used to determine hardenability of steels. How will you draw hardenability curves using this test? (16)

18. (a) (i) What are slip and twinning? What are their characteristics. (8)

(ii) Write a short note about different types of metallic fractures. Discuss the characteristics of ductile fracture and brittle fracture. (8)

Or

(b) (i) Explain Creep with neat sketch. (8)

(ii) What is Fatigue? Explain with neat sketch. (8)

19. (a) What is an alloy steel? How alloy steels are classified? Explain in detail. (16)

Or

(b) Discuss the composition, properties and typical applications of any four copper alloys. (16)

20. (a) (i) Discuss the properties and applications of ceramic materials in industries. (8)

(ii) With schematic diagrams illustrate the processing of fiber reinforced composites. (8)

Or

(b) Discuss the properties and mention their applications of the following engineering ceramics

(i)  $Al_2O_3$       (ii)  $SiC$       (iii)  $Si_3N_4$       (iv) Sialons (16)

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