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**Reg. No. :**

**Question Paper Code: 45072**

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2017

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)

 1. Eutectic reaction for iron carbon system occurs at

 (a) 6000 C (b) 7230 C (c) 11470 C (d) 14930 C

 2. The reaction that, on heating one solid phase, yields another solid phase and one liquid

 phase is called

 (a) Eutectic (b) Eutectoid (c) Peritectic (d) Peritectoid

 3. Which one of the following mediums is used for fastest cooling rate of steel quenching

 (a) Air (b) Oil (c) Water (d) Brin

 4. Which of the following material has maximum ductility?

 (a) Mild steel (b) Copper (c)Nickel (d) 6000 bytes

 5. 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

6. Poisson’s ratio is

 (a) Linear stress/lateral stress (b) Linear strain/lateral strain (c) Lateral stress/lateral stress (d) Lateral strain/linear strain

7. The percentage of carbon in cast iron usually various 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. The heat treatment process used for softening hardened steel is

 (a) Carburising (b) Normalising (c) Anneling (d) Tempering

9. Which one of the following materials is not a composite?

(a) Wood (b) Concrete (c) Plywood (d) Sialon

10. The most principal load carrying member in fiber composite is

 (a) Fiber (b) Matrix (c) Interface (d) Fillers

 PART - B (5 x 2 = 10 Marks)

11. Explain GIBB’s phase rule.

12. What is meant by case hardening?

13. What is meant by Ductility?.

14. List out effects of alloying additions on steel.

15. Name any two polymers and state their applications.

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 iron-iron carbon equilibrium diagram and mention their salient temperatures

 and composition. (16)

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17. (a) Explain Annealing, Process annealing, Stress relief and Normalizing in detail. (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

R(z)

$$\frac{1}{s(s+1)}$$

ZOH

C(z)

T

T

-

+

R(z)

$$\frac{1}{s(s+1)}$$

ZOH

C(z)

T

T

-

+

 (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) Explain ceramic composite and its any two types of fabrication processes. (16)