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Question Paper Code: 41752

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2016

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
- 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
- Fine grain sizes are obtained by
(a) slow cooling (b) increasing nucleation rate
(c) decreasing growth rate (d) fast cooling
- Case hardening is the only method suitable for hardening
(a) high alloy steel (b) high carbon steel
(c) low-carbon steel (d) high speed steel
- The hardness number 1 on Moh's scale is assigned to
(a) quartz (b) talc (c) topaz (d) diamond

6. Brinell tester uses a hardness steel ball of size
 (a) 1 mm (b) 5 mm (c) 10 mm (d) 15 mm
7. Copper is ductile, because
 (a) it is a perfect crystal (b) it contains a very high density of dislocation
 (c) it has glassy structure (d) the stress to move a dislocation in it is low
8. The purpose of alloying nickel to copper is
 (a) to raise hardness (b) to impart free-machining properties
 (c) to increase strength and ductility (d) to improved hardness and strength
9. Which one of the following is a cross-linked polymer?
 (a) Polyester (b) Polythene (c) Bakelite (d) PTFE
10. Polymethyl Methacrylate (PMMA) is known as
 (a) Perspex (b) Teflon (c) Bakelite (d) Nylon 6

PART - B (5 x 2 = 10 Marks)

11. Differentiate between eutectic and eutectoid phase reactions.
12. What is meant by case hardening?
13. State any two differences between HRB and HRC.
14. How to classify stainless steel materials?
15. Name any two polymers and state their applications.

PART - C (5 x 16 = 80 Marks)

16. (a) Explain the following invariant reactions with reference to a phase diagram
 (i) Eutectic reaction (ii) Eutectoid reaction
 (iii) Peritectic reaction (iv) Peritectoid reaction (16)
- Or
- (b) Draw iron-iron carbon equilibrium diagram and mention their salient temperatures and composition. (16)
17. (a) (i) Draw a neat sketch of the TTT diagram of eutectoid steel and label the various regions. (12)

(ii) Write a short note on critical cooling curve. (4)

Or

(b) Write short note on the following surface heat treatment operations:

- (i) Carburizing (ii) Nitriding
(iii) Cyaniding (iv) Carbonitriding (16)

18. (a) (i) Explain the mechanism of fatigue fracture. (8)

(ii) Discuss any two mechanism of creep fracture. (8)

Or

(b) (i) Explain the testing procedure for Rockwell Hardness. (8)

(ii) Explain the testing procedure for IZOD impact. (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) Differentiate commodity plastics and engineering plastics. (4)

(ii) Write briefly about the following thermoplastics:

- (1) Polyethylene (2) Polyvinyl chloride (3) Polyimide (12)

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)

