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Question Paper Code: 55702

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2022

Fifth Semester

Mechanical Engineering

15UME502 - ENGINEERING MATERIALS AND METALLURGY

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

- Which reaction does this equation denote? CO1- R
Solid 1 + Solid 2 \rightarrow Solid 3
(a) Eutectic (b) Peritectic (c) Eutectoid (d) Peritectoid
- How much carbon is present in cast irons? CO1- R
(a) Less than 0.05% (b) Up to 1.5% (c) 1.5% to 2% (d) More than 2%
- Full annealing is applied to which kind of materials? CO2- R
(a) Steel castings (b) Steel wires (c) High carbon steels (d) Sheet products
- For hardening of steel by quenching, the steel is cooled in _____ CO2- R
(a) Furnace (b) Still air (c) Oil bath (d) Cooling tower
- The permanent mode of deformation of a material known as _____ CO3- R
(a) Elasticity (b) Plasticity (c) Slip deformation (d) Twinning deformation
- What kind of indenter is used in a Brinell test? CO3- R
(a) Diamond cone (b) Steel ball (c) Pen dot (d) Long tube
- Stainless steels with little carbon and no nickel are called _____ CO4- R
(a) Ferritic stainless steel (b) Austenitic stainless steel
(c) Martensitic stainless steel (d) Duplex stainless steel
- Compared to copper, how is the electrical conductivity of aluminum? CO4- R
(a) Higher (b) Lower (c) Equal (d) Zero
- A polymer made of identical monomer units is called _____ CO5- R
(a) Homopolymer (b) Linear polymer (c) Copolymer (d) Branched polymer

10. Which of the following is a property of ceramics? CO5- R
- (a) Low strength (b) Low melting point
 (c) Resistant to corrosion (d) Bad insulation

PART – B (5 x 2= 10 Marks)

11. Write a typical peritectoid reaction. CO1- U
12. Mention few applications of induction hardening system. CO2- U
13. Differentiate ductile and brittle fractures. CO3- U
14. What are the effects of adding Si in steels? CO4- U
15. Differentiate thermosetting and thermoplastic polymers. CO5- U

PART – C (5 x 16= 80Marks)

16. (a) (i) Explain eutectic reaction and eutectoid reaction with reference to a phase diagram. CO1- U (8)
- (ii) Neatly sketch labeled Iron-Carbon equilibrium diagram. CO1- U (8)
 Name, write and explain the reactions involved.
- Or
- (b) (i) Discuss the classification of cast iron and draw its microstructure. CO1- U (10)
- (ii) State the properties and applications of plain carbon steel. CO1- U (6)
17. (a) Compare and contrast the process of full annealing, stress relief annealing, recrystallization annealing and spheroidise annealing. CO2-Ana (16)
- Or
- (b) Differentiate hardness and hardenability. Explain with a neat sketch, the procedure to plot the hardenability curves for eutectoid steel in Jominy End Quench Test. CO2- Ana (16)
18. (a) Sketch and describe the following hardness tests. CO3- U (8)
- (i) Brinell
- (ii) Vickers CO3- U (8)
- Or
- (b) Compare and contrast the charpy and izod test with relevant sketch. CO3- U (16)

19. (a) Discuss the influence of various alloying elements in steel. CO4- U (16)
- Or
- (b) Discuss the composition, properties and typical applications of any four copper alloys. CO4- U (16)
20. (a) Discuss the properties and applications of any eight varieties of polymers used as engineering materials. CO5- U (16)
- Or
- (b) Give any two important properties of ceramics. Write short notes on any four ceramic materials. CO5- U (16)

