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

Question Paper Code: 55702

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2019

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)

1. Which reaction does this equation denote? CO1- R
   Solid 1 + Solid 2 →Solid 3
   (a) Eutectic (b) Peritectic (c) Eutectoid (d) Peritectoid
2. 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%
3. Full annealing is applied to which kind of materials? CO2- R
   (a) Steel castings (b) Steel wires (c) High carbon steels (d) Sheet products
4. For hardening of steel by quenching, the steel is cooled in _____ CO2- R
   (a) Furnace (b) Still air (c) Oil bath (d) Cooling tower
5. The permanent mode of deformation of a material known as _____ CO3- R
   (a) Elasticity (b) Plasticity (c) Slip deformation (d)Twinning deformation
6. What kind of indenter is used in a Brinell test? CO3- R
   (a) Diamond cone (b) Steel ball (c) Pen dot (d) Long tube
7. 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
8. Compared to copper, how is the electrical conductivity of aluminum? CO4- R
   (a) Higher (b) Lower (c) Equal (d) Zero
9. 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. Name, write and explain the reactions involved. CO1- U (8)

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)