

A

Reg. No. :

| | | | | | | | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|

Question Paper Code: U2705

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

Second Semester

Mechanical Engineering

21UME205 - Engineering Materials and Metallurgy

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. What is the crystal structure of austenite upon heating? CO1- U
(a) Body-centered cubic (b) Face-centered cubic
(c) Hexagonal closely packed (d) Body-centered tetrahedral
2. Alloys containing 2.0-6.7% carbon are considered as _____ CO1- U
(a) Steel (b) Cast-iron (c) Aluminum (d) Brass
3. Full annealing is applied to which kind of materials? CO1- U
(a) Steel castings (b) Steel wires (c) High carbon steels (d) Sheet products
4. Which of the following is not a stage of annealing? CO1- U
(a) Heating (b) Soaking (c) Tempering (d) Quenching
5. Slow plastic deformation of metals under a constant stress is known as CO1- U
(a) Creep (b) Fatigue (c) Gradual deformation (d) Endurance limit
6. In Brinell hardness testing the timer for loading is CO1- U
(a) 5 sec (b) 15 sec (c) 30sec (d) 1 minute
7. Wear resistance of an alloy steel can be improved by adding _____ CO1- U
(a) Tungsten (b) Vanadium (c) Manganese (d) Titanium
8. Corrosion resistance of an alloy steel can be improved by adding _____ CO1- U
_____ (a) Tungsten (b) Vanadium (c) Chromium (d) Titanium

9. Which among the following polymers have lowest solubility? CO1- U
 (a) polyethylene (b) polystyrene (c) nylon 6 (d) epoxy resin
10. Which polymer additive is used to remove parts from molds? CO1- U
 (a) Plasticizers (b) Stabilizers (c) Lubricants (d) Reinforcements

PART – B (5 x 2= 10 Marks)

11. Explain ferrite and cementite in Fe-C alloys. CO2- U
12. Define Quenching. CO2- U
13. Define endurance limit in fatigue test. CO2- U
14. What are bearing materials? CO2- U
15. Differentiate commodity plastics with engineering plastics CO2- U

PART – C (5 x 16= 80 Marks)

16. (a) Classify Iron-Iron carbide diagram and compare cast iron and steel and also distinguish cementite, ferrite and pearlite. CO3- App (16)
 Or
 (b) How will you plot binary phase diagram for two metals which are completely soluble in liquid and completely insoluble solid state? CO2- U (16)
17. (a) Describe why are TTT diagrams usually not applicable to industrial engineering practices? CO3- App (16)
 Or
 (b) Classify case hardening process and compare any two process with neat sketches. CO2- U (16)
18. (a) Describe a Brinell hardness test to determine the hardness of a metal. CO2- U (16)
 Or
 (b) Explain the mechanism of plastic deformation of metals by slip and twinning? CO2- U (16)
19. (a) Write an engineering brief (composition, heat treatment, properties) about the following steels: [a] Tool steel [b] HSLA steel [c] Maraging steels [d] Spring Steel [e] TRIP steel CO2- U (16)

Or

- (b) Discuss the composition, properties, application of different types of cast irons. CO2- U (16)
20. (a) Describe the difference between thermoplastics and thermosetting plastics. CO2- U (16)
- Or
- (b) Explain the important engineering ceramic materials and discuss its general applications of ceramic materials in various engineering fields. What are the advantages and disadvantages of ceramics? CO2- U (16)

