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Question Paper Code: U2705

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

- Peritectic reactions are applicable for carbon contents up to _____ CO1- R
(a) 0.1% (b) 0.26% (c) 0.55% (d) 0.96%
- Alloys containing 2.0-6.7% carbon are considered as _____ CO1- R
(a) Steel (b) Cast-iron (c) Aluminum (d) Brass
- Full annealing is applied to which kind of materials? CO1- R
(a) Steel castings (b) Steel wires (c) High carbon steels (d) Sheet products
- Which of the following is not a stage of annealing? CO1- R
(a) Heating (b) Soaking (c) Tempering (d) Quenching
- Slow plastic deformation of metals under a constant stress is known as CO1- R
(a) Creep (b) Fatigue (c) Gradual deformation (d) Endurance limit
- In Brinell hardness testing the timer for loading is CO1- R
(a) 5 sec (b) 15 sec (c) 30sec (d) 1 minute
- Wear resistance of an alloy steel can be improved by adding _____ CO1- R
(a) Tungsten (b) Vanadium (c) Manganese (d) Titanium
- Corrosion resistance of an alloy steel can be improved by adding CO1- R
_____ CO1- R
(a) Tungsten (b) Vanadium (c) Chromium (d) Titanium
- Which among the following polymers have lowest solubility? CO1- R
(a) polyethylene (b) polystyrene (c) nylon 6 (d) epoxy resin

10. Which polymer additive is used to remove parts from molds? CO1- R
(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) Describe with the aid of a diagram the Substitutional and interstitial solid solution CO2- U (16)
Or
(b) Explain with a brief Isomorphous phase diagram for Cu-Ni system and Ideal phase diagram CO2- U (16)
17. (a) Draw a neat sketch of the TTT diagram for eutectoid steel and label the regions. Mark the difference products formed on this diagram CO1- U (16)
Or
(b) Explain the process of nitriding. List and discuss the advantages of nitriding over carburizing CO1- 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) Discuss the composition properties and typical application of any four copper alloys? CO2- U (16)
Or
(b) Explain the effects of following alloying elements on steel CO2- U (16)
(i) Chromium (ii) Molybdenum. Also state any three objectives of adding alloying elements on steel.

20. (a) Describe the molecular structure, properties and applications of the following polymers PP, PE,PC,PA,PS and PVC. CO2- U (16)

Or

(b) Describe the difference between thermoplastics and thermosetting plastics. CO2- U (16)

