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Question Paper Code: U2P03

B.E./B.Tech. DEGREE EXAMINATION, NOV 2023

Second Semester

Mechanical Engineering

21UPH203- Applied Material Science

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. The efficiency of an Otto cycle increases as CO1- U
 - (a) compression ratio decreases
 - (b) compression ratio increases
 - (c) adiabatic expansion ratio increases
 - (d) isothermal expansion ratio increases.

2. A diesel cycle works at CO5-App
 - (a) constant pressure
 - (b) constant volume
 - (c) constant temperature
 - (d) constant heat

3. Which of the following is a weak magnet? CO2-U
 - (a) Ferromagnetic material
 - (b) Anti ferromagnetic
 - (c) Paramagnetic
 - (d) Diamagnetic

4. A superconductor is a _____ CO2-U
 - (a) Purely paramagnetic
 - (b) purely diamagnetic
 - (c) purely ferromagnetic
 - (d) none of these

5. Shape memory alloys demonstrate CO2-U
 - (a) Thermal hysteresis
 - (b) Electrical hysteresis
 - (c) magnetic hysteresis
 - (d) No hysteresis

6. Which of the following is a metallic glass? CO2-U
 (a) Argon (b) crypton (c) Gold (d) Nickel
7. The colour of the nano gold particles is _____ CO2-U
 (a) Yellow (b) Orange (c) Red (d) Variable
8. Quantum dots can be used in _____ CO2-U
 (a) Crystallography (b) Mechanics (c) Optoelectronics (d) Quantum physics
9. Hardness during over-aging CO1-U
 (a) Decreases (b) Increases (c) Constant (d) Decreases abruptly
10. Fine grain size, usually, cannot be obtained during the following CO1-U
 process
 (a) Slow cooling (b) increasing nucleation rate
 (c) retarding grain growth (d) fast cooling

PART – B (5 x 2= 10Marks)

11. Define an isolated system CO1-U
12. The critical magnetic field at 5 K is 2×10^3 A/m in a super conductor ring of radius 0.02 m. find the value of critical current CO4-App
13. What are shape memory alloys? CO2-U
14. What is the dimension of quantum dot? CO1-U
15. Mention the expression for brinell hardness number CO1-U

PART – C (5 x 16= 80Marks)

16. (a) State and explain the laws of thermodynamics. What is the CO1-U (16)
 significance of the first law of thermodynamics?
 Or
 (b) Explain principle and working of Internal combustion engine CO1-U (16)
17. (a) What are ferromagnetic materials? Discuss the domain theory of a CO2-U (16)
 ferromagnetic material.
 Or
 (b) Explain in detail, various properties and important applications of CO2-U (16)
 superconducting materials

18. (a) Discuss the properties, types and applications of metallic glasses CO2-U (16)
Or
(b) What are shape memory alloys? Write the characteristics. List out any four applications of shape memory alloys CO2-U (16)
19. (a) Discuss in detail how the mechanical and optical properties of nano materials vary with particle size CO2-U (16)
Or
(b) Discuss the structure, properties of carbon nano tubes and its applications CO2-U (16)
20. (a) Explain in detail the strengthening mechanisms in amorphous materials CO1-U (16)
Or
(b) How will you find hardness of a material using Brinell hardness test CO1-U (16)

