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

## Question Paper Code: U2P03

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

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. The efficiency of an otto cycle is 50% and ϒ is 1.5. Calculate the compression ratio CO5-App

   (a) 4 (b) 5 (c) 6 (d) 7

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. On both ends of the CNTs, which carbon nanostructure is placed? CO2-U

(a) Graphite (b) Benzene (c) C60 (d) Diamond

8. Quantum dots can be used in _____ CO2-U

(a) Crystallography (b) Mechanics (c) Optoelectronics (d) Quantum physics

9. In terms of which of the following properties. Metals are better than ceramics CO1-U

(a) Hardness (b) Toughness (c) Yield strength (d) Ductlity

10. Fine grain size, usually, cannot be obtained during the following process CO1-U

(a) Slow cooling (b) increasing nucleation rate

(c) retarding grain growth (d) fast cooling

PART – B (5 x 2= 10Marks)

11. Calculate the efficiency of the Carnot's engine working between ice point and steam point. CO5-App

12. The critical magnetic field at 5 K is 2 x$10^3$ A/m in a super conductor ring of radius 0.02 m. find the value of critical current CO4-App

13. What is meant by glass transition temperature? CO2-U

14. What is the dimension of quantum dot? CO1-U

15. List out the types of hardness test CO1-U

PART – C (5 x 16= 80Marks)

16. (a) What is Heat? Explain the different modes heat transfer with suitable examples CO1-U (16)

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 ferromagnetic material. CO2-U (16)

Or

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| | (b) | Explain in detail, various properties and important applications of superconducting materials | CO2-U | (16) |
| 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 various mechanisms of strengthening metals and alloys | CO1-U | (16) |
| | | Or | | |
| | (b) | Explain principle and working of Tensile test. What are the factors measured from this test | CO1-U | (16) |