Question Paper Code **13757**

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2025
Second Semester
Mechanical Engineering
(Common to Mechanical and Automation Engineering)
24BSPH202 – PHYSICS OF MATERIALS
Regulations - 2024

Duration: 3 Hours Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)
Answer ALL Questions

		Marks	K–Level	CO

1. The main use of a binary phase diagram in metallurgy is _____ *1* *K1* *CO1*
   (a) To determine the electrical conductivity of an alloy
   (b) To predict the phases present at specific temperatures and compositions
   (c) To measure the density of an alloy
   (d) To assess the color change during heating

2. If an alloy's composition lies at the midpoint of a tie line, the relative proportions of the two phases are: *1* *K1* *CO1*
   (a) 50% each (b) 25% and 75%
   (c) Dependent on the temperature (d) Not predictable

3. _____is the predominant microstructure of plain carbon steel when slow-cooled? *1* *K1* *CO2*
   (a) Bainite (b) Pearlite and ferrite (c) Martensite (d) Cementite

4. Cementite in the microstructure of steel is: *1* *K1* *CO2*
   (a) A solid solution of carbon in iron (b) A stoichiometric compound of Fe_3C
   (c) An amorphous phase in steel (d) Pure carbon in crystalline form.

5. Which property is most characteristic of ferromagnetic materials? *1* *K1* *CO3*
   (a) High electrical conductivity (b) Spontaneous alignment of magnetic domains
   (c) Resistance to magnetization (d) Lack of response to external magnetic fields

6. Which material is commonly used in the cores of transformers? *1* *K1* *CO3*
   (a) Ferrites (b) Copper (c) Aluminum (d) Stainless steel

7. The dielectric constant (ε_r) of a material represents: *1* *K1* *CO4*
   (a) The material's resistance to magnetic fields
   (b) The ratio of permittivity of the material to free space
   (c) The electric conductivity of the material
   (d) The material's heat resistance

8. The BCS theory explains superconductivity as: *1* *K1* *CO4*
   (a) Magnetic domain alignment (b) Electron pairing into Cooper pairs
   (c) Ionization of atoms at low temperatures (d) High energy electron interactions

9. Nanomaterials are defined by: *1* *K1* *CO5*
   (a) Their molecular composition
   (b) Their size, which is typically less than 100 nanometers
   (c) Their high electrical resistance
   (d) Their use only in the automotive sector

10. What is the primary purpose of a drug delivery system? *1* *K1* *CO6*
    (a) To enhance the taste of medication
    (b) To deliver drugs to specific target sites in the body effectively
    (c) To reduce the cost of drug manufacturing
    (d) To improve the shelf life of medications

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create **13757**

PART - B (12 × 2 = 24 Marks)
Answer ALL Questions

11. Write a short note on phase diagram.	2	K1	CO1
12. List the differences between eutectic reaction and Peritectic reaction.	2	K2	CO1
13. State Fick's first and second laws.	2	K1	CO2
14. Mention methods of increasing fatigue life.	2	K1	CO2
15. Define magnetic Permeability.	2	K1	CO3
16. State Curie – Weiss law.	2	K1	CO3
17. List any three uses of a dielectric material.	2	K1	CO4
18. Define SQUID.	2	K1	CO4
19. Define pseudoelastic effect.	2	K1	CO5
20. What is the role of matrix and reinforcement in composites?	2	K2	CO5
21. Write short notes on bottom up process.	2	K1	CO6
22. Give any two examples of ceramic biomaterials.	2	K1	CO6

PART - C (6 × 11 = 66 Marks)
Answer ALL Questions

23.	a) Discuss about Gibbs free energy and its applications to alloy formation.	11	K2	CO1
	OR			
	b) Explain isomorphous system with one example.	11	K2	CO1
24.	a) Draw the iron-carbon phase diagram and explain the various regions in it.	11	K2	CO2
	OR			
	b) Explain the procedure of Brinell hardness test and give its advantages and limitations.	11	K2	CO2
25.	a) Distinguish between dia, para, and ferro magnetism.	11	K2	CO3
	OR			
	b) Explain the domain structure in ferromagnetic materials. Show how the Hysteresis curve is explained on the basis of domain theory.	11	K2	CO3
26.	a) Write in detail about the various factors contributing to breakdown in dielectrics.	11	K2	CO4
	OR			
	b) Discuss about the Type-I and Type-II Superconductors.	11	K2	CO4
27.	a) Summarize the structural, mechanical, electrical, magnetic and chemical properties of metallic glasses.	11	K2	CO5
	OR			
	b) Discuss about biomaterials and its applications.	11	K2	CO5
28.	a) Explain quantum confinement and quantum structures in nanomaterials.	11	K2	CO6
	OR			
	b) Discuss the properties and applications of nanomaterials in electronics and photonics.	11	K2	CO6

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

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