Question Paper Code	12992

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024
Second Semester

Mechanical Engineering

(Common to Mechanical and Automation Engineering)

20BSPH202 - PHYSICS OF MATERIALS
Regulations - 2020

Duration: 3 Hours   Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)
Answer ALL Questions

		Marks	K-Level	CO
1.	The one P-T-V combination at which solid, liquid and vapour are in equilibrium, is called	1	K1	CO1
	(a) Critical point (b) Triple point (c) Saturation point (d) None of the above			
2.	German silver is the alloy of	1	K1	CO1
	(a) Ag (b) Refine Ag (c) Ni, Zn and Cu (d) Fe-C			
3.	Cast iron has carbon in which form	1	K2	CO1
	(a) Free Carbon (b) Graphite (c) Cementite (d) White carbon			
4.	Which of the following is the hardest?	1	K1	CO2
	(a) Cementite (b) Ferrite (c) Pearlite (d) Martensite			
5.	What is the magnitude of the eutectic temperature?	1	K1	CO2
	(a) 727°C (b) 768°C (c) 1146°C (d) 1495°C			
6.	Gamma iron has structure of	1	K2	CO2
	(a) BCC (b) FCC (c) HCP (d) BCT			
7.	Steel is a _____ alloy.	1	K1	CO3
	(a) Fe-C (b) Ag-Au (c) Mo-W (d) Cu-Ni			
8.	Which property decreases the strain hardening?	1	K2	CO3
	(a) Hardness (b) UTS (c) Ductility (d) Yield Strength			
9.	Which material is with high elasticity?	1	K1	CO3
	(a) Rubber (b) Glass (c) Steel (d) Copper			
10.	In the ratio of the induced dipole moment to the electric field strength (p/E), the 'E' stands for _____.	1	K1	CO4
	(a) Electrical resistance (b) Electronic structure			
	(c) Electric field strength (d) Electron cloud size			
11.	Paramagnetic material acts as a _____	1	K1	CO4
	(a) Strong magnet (b) Weak magnet (c) Very strong magnet (d) None of the above			
12.	What units are typically used to measure electronic polarizability?	1	K1	CO4
	(a) Meters per Volt (b) Cubic Meters per Volt			
	(c) Cubic Meters per Ampere (d) Picometers Squared per Volt			
13.	Ferromagnetic material exhibits____	1	K1	CO5
	(a) Hysteresis (b) Magnetic curve (c) Zero magnetization (d) Opposite direction			
14.	Which of the following material is a ferromagnetic material?	1	K1	CO5
	(a) Iron (b) Nickel (c) Cobalt (d) All the above			
15.	What principle underlies the operation of a magnetic levitation (MagLev) train	1	K1	CO5
	(a) Lorentz force (b) Faraday's law of Induction			
	(c) Lenz's law (d) Ampere's circuital law			
16.	The energy required by a dielectric material to lose its insulating property is known as ----	1	K2	CO5
	(a) dielectric mechanism (b) dielectric constant			
	(c) dielectric flux (d) dielectric strength			

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create   **12992**

17. The reason for nanomaterials is superior than bulk materials ---   *1 K1 CO6*
    (a) Low surface to volume ratio   (b) degrees of freedom
    (c) High surface to volume ratio   (d) harmless
18. The equimolar Ni-Ti alloy, is known as from the following,   *1 K1 CO6*
    (a) Nitinol   (b) Alcohol   (c) Amalgam   (d) None of the above
19. The quantum size effect _____ the electronic properties in the nanomaterial   *1 K1 CO6*
    (a) Degrade   (b) Enhance   (c) No change   (d) None of the above
20. What property of Ni-Ti alloys is exploited in deployable structures like antennas and solar panels for satellites?   *1 K1 CO6*
    (a) Corrosion resistance   (b) Shape Memory
    (c) Biocompatibility   (d) High Damping Capacity

PART - B (10 × 2 = 20 Marks)
Answer ALL Questions

21. What is lever rule?   *2 K1 CO1*
22. Define Hume – Rothery's rule.   *2 K1 CO1*
23. State second fick's law of diffusion.   *2 K1 CO2*
24. What are the phases present in iron-carbon phase diagram?   *2 K1 CO2*
25. What is slip and twinning?   *2 K1 CO3*
26. What is creep?   *2 K1 CO3*
27. What is ferromagnetism?   *2 K1 CO4*
28. Differentiate between Soft and Hard Magnetic materials.   *2 K2 CO4*
29. Define glass transition temperature.   *2 K1 CO5*
30. Give any two applications of superconductors.   *2 K1 CO6*

PART - C (6 × 10 = 60 Marks)
Answer ALL Questions

31. a) Explain isomorphism (Cu – Ni) phase diagram with its microstructure.   *10 K2 CO1*
    OR
    b) Explain unary phase diagram of iron and explain different phases.   *10 K2 CO1*

32. a) Explain TTT diagram for eutectoid steel.   *10 K2 CO2*
    OR
    b) Explain the microstructural changes on hypo eutectoid and hypereutectoid steel.   *10 K2 CO2*

33. a) Explain fatigue fracture in detail and different stages involved.   *10 K2 CO3*
    OR
    b) Discuss the use of Vicker's method in determining micro hardness of a material.   *10 K2 CO3*

34. a) Describe any two types of polarization.   *10 K2 CO4*
    OR
    b) Explain the hysteresis behavior of ferromagnetic materials and discuss it based on domain theory.   *10 K2 CO4*

35. a) Explain Meissner effect, isotope effect and magnetic levitation.   *10 K2 CO5*
    OR
    b) Describe the role of matrix material and reinforcement.   *10 K2 CO5*

36. a) Explain in detail about applications of nanophase materials.   *10 K2 CO6*
    OR
    b) Explain the characteristics and applications of SMA.   *10 K2 CO6*