Reg. No.															

Question Paper Code	14118

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025

Second Semester

Mechanical 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.	What is an alloy? (a) A pure metal (b) A radioactive element (c) A non-metallic compound (d) A mixture of metals or metals with non-metals	1	K1	CO1
2.	A binary phase diagram shows the relationship between: (a) Time and temperature (b) Pressure and temperature (c) Temperature and composition for two components (d) Volume and temperature	1	K1	CO1
3.	Ferrous alloys are alloys that primarily contain which element? (a) Aluminium (b) Copper (c) Iron (d) Zinc	1	K1	CO2
4.	Fatigue in materials is caused by: (a) Constant temperature (b) Repeated cyclic loading (c) One-time static load (d) Slow cooling	1	K1	CO2
5.	Magnetic permeability (μ) is a measure of: (a) Resistance to electricity (b) Ability to store charge (c) Temperature of a material (d) Ability of a material to support magnetic field	1	K1	CO3
6.	In antiferromagnetic materials, magnetic moments: (a) Align parallel (b) Align randomly (c) Align antiparallel and cancel out (d) Do not exist	1	K2	CO3
7.	Dielectric materials are mainly used to: (a) Conduct electricity (b) Block light (c) Store electric charge (d) Generate sound	1	K1	CO4
8.	Which of the following is a property of superconductors? (a) High electrical resistance (b) Expulsion of magnetic field (c) Low thermal conductivity (d) Strong magnetism	1	K1	CO4
9.	Shape memory effect is shown due to the transformation between: (a) Austenite and Pearlite (b) Martensite and Austenite (c) Ferrite and Cementite (d) Martensite and Pearlite	1	K2	CO5
10.	A Quantum Dot confines electrons in: (a) One dimension (b) Two dimensions (c) Three dimensions (d) Four dimensions	1	K1	CO6

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

		Marks	K – Level	CO
11.	Define Gibbs free energy.	2	K1	CO1
12.	State the lever rule in phase diagram.	2	K1	CO1
13.	What is meant by hypoeutectic alloy and hypereutectic alloy?	2	K2	CO2
14.	Enumerate the mechanical properties of ferrous alloys.	2	K2	CO2
15.	What are dielectric materials?	2	K1	CO3
16.	Write a short note on Cryotron.	2	K2	CO3
17.	Write down Langevin-Debye equation.	2	K2	CO4
18.	Prove that the superconductor exhibit diagmagnetism.	2	K3	CO4
19.	Define shape memory effect.	2	K1	CO5
20.	What are composite materials?	2	K1	CO5

21.		Justify how quantum confinement in a quantum well affects its electronic and optical properties.	2	K3	CO6
22.		Define Quantum dots.	2	K1	CO6

PART – C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	Discuss in detail the various types of alloying elements and their effects on material properties.	11	K2	CO1
		OR			
	b)	Examine the eutectic phase diagram of Pb-Sn alloy and explain its characteristic and uses.	11	K3	CO1
24.	a)	Sketch the Iron carbon / Fe – Fe_3C phase diagram and explain the various phases and invariant reactions in it.	11	K3	CO2
		OR			
	b)	Justify how microhardness is determined using Vickers method.	11	K3	CO2
25.	a)	Describe the ferromagnetic domain theory in detail.	11	K2	CO3
		OR			
	b)	Describe the structure and applications of ferrites.	11	K2	CO3
26.	a)	Derive an expression for electronic polarization and explain its significance.	11	K3	CO4
		OR			
	b)	Demonstrate the principle and working of magnetic levitation and SQUID.	11	K3	CO4
27.	a)	Utilize the knowledge of properties of metallic glasses and explain the various applications of metallic glasses in detail.	11	K3	CO5
		OR			
	b)	Make use of the properties of biomaterials and explain their applications in detail.	11	K3	CO5
28.	a)	Choose any one method of nanomaterial synthesis and explain their applications.	11	K3	CO6
		OR			
	b)	Discuss the various applications of nanomaterials in detail.	11	K2	CO6