Reg. No ..... Name **26P238**

M. Sc. DEGREE END SEMESTER EXAMINATION - APRIL 2026

SEMESTER 2 : PHYSICS

COURSE : **24P2PHYT07 : CONDENSED MATTER PHYSICS**

(For Regular 2025 Admission and Improvement/Supplementary 2024 Admission)

Time : Three Hours Max. Weights: 30

PART A

Answer any 8 questions **Weight: 1**

1.	State Dulong and Petit's law.	(R)
2.	List any two drawbacks of Drude-Lorentz model.	(A)
3.	Discuss the important symmetry elements in crystals.	(An)
4.	What is umklapp scattering process of a photon?	(A)
5.	Substantiate the statement, 'a monatomic linear lattice acts as a low pass filter, while a diatomic chain behaves as band-pass filter.	(E)
6.	What do you understand by ferrimagnetism?	(U)
7.	Find the ratio between spacing between (101) and (111) planes.	(A)
8.	What are quantum wells?	(U)
9.	Explain the geometrical structure factor.	(A)
10.	State and explain Bloch theorem.	(U)

(1 x 8 = 8)

PART B

Answer any 6 questions **Weights: 2**

11.	Find the resistance of an intrinsic germanium rod which is 1 cm long, 1 mm wide and 1 mm thick at 300 K. The intrinsic carrier density at 300 K is $2.5x10^{19}/m^3$ and the mobilities of electron and hole are 0.39 and 0.19 $m2V^{-1}s^{-1,}$ respectively.	(A)
12.	An intrinsic semiconductor material A has an energy gap 0.6 eV while material B has an energy gap 0.12 eV. Compare the intrinsic carrier densities in these two material at 300 K. Assume that the effective masses of all the electrons and holes are equal to the free electron mass.	(E)
13.	Explain the lattice vibration in a monoatomic lattice.	(U)
14.	The penetration depth of mercury at 3.5 K is about 750 A^0. Estimate the penetration depth at 0 K.	(An)
15.	Show that the reciprocal lattice of Bcc is fcc.	(U)
16.	Give an account on the quantization of lattice vibrations.	(An)
17.	A magnetic induction of $2x10^{-4}$ web/m^2 in vacuum produces magnetic flux of $2.4x10^{-8}$ web in a bar of area of cross section $2x10^{-5}$ m^2. Calculate (a) magnetizing field (b) magnetic induction in the bar and (c) Intensity of magnetization?	(U)
18.	Lattice constant of a cubic crystal is 4.12 Å. Find the inter-planar spacing between the planes (111)?	(A)

(2 x 6 = 12)

PART C

Answer any 2 questions **Weights: 5**

19.	Obtain expression for wave function and energy eigen values for electrons confined to a line of length L. Derive expression for Fermi energy and density of states.	(A)
20.	Discuss Debye model of lattice heat capacity. Derive an expression for it.	(An)
21.	Discuss Kronig Penney model. Using the model show that the energy spectrum of electron consists of a number of allowed energy bands separated by forbidden regions.	(A)
22.	What is meant by spontaneous magnetic moment of a ferromagnet? Obtain an expression for susceptibility in terms of Curie point.	(R)

(5 x 2 = 10)

OBE: Questions to Course Outcome Mapping

CO	Course Outcome Description	CL	Questions	Total Wt.

Cognitive Level (CL): Cr - CREATE; E - EVALUATE; An - ANALYZE; A - APPLY; U - UNDERSTAND; R - REMEMBER;