Reg. No ..... Name **25P2036**

M. Sc. DEGREE END SEMESTER EXAMINATION - APRIL 2025

SEMESTER 2 : PHYSICS

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

(For Regular 2024 Admission)

Time : Three Hours Max. Weights: 30

PART A

Answer any 8 questions **Weight: 1**

1.	Give drawbacks of the Debye model?	(U)
2.	What is meant by an extrinsic semiconductor?	(A)
3.	What is the normal scattering process of a photon?	(U)
4.	What are Fullerenes?	(A)
5.	What are antiferromagnetic materials?	(A)
6.	What is meant by Optical mode of wave propagation in linear diatomic crystal	(U)
7.	Define the terms, mean free path and relaxation time. Obtain the expressions for both.	(A)
8.	Explain the concept of 'effective mass"?	(U)
9.	Give the expression for density of energy states in metals?	(E)
10.	Draw (110) plane?	(A)

(1 x 8 = 8)

PART B

Answer any 6 questions **Weights: 2**

11.	The applied magnetic field in copper is 10^6A/m. If the magnetic susceptibility of the copper is -0.8×10^{-5}, calculate the density and magnetization in copper.	(A)
12.	A magnetizing field 100 A/m produces a flux density $4\pi\times10^{-3}$ T in a bar of material Calculate the relative permeability and susceptibility of the material?	(A)
13.	Prove that the reciprocal lattice of a bcc lattice is an fcc lattice.	(A)
14.	A uniform silver wire has a resistivity of 1.54×10^{-8}ohm.meter at room temperature. For an electric field along the wire of 1 V/cm, compute the average drift velocity of the electrons assuming that there are 5.8×10^{28}conduction electrons /m^3. Also calculate the mobility and the relaxation time of the electron.	(E)
15.	In a tetragonal lattice a=b=(1/2) nm and c=(1/3) nm. Determine the lattice spacing between (111) planes?	(A)
16.	The intrinsic carrier density at room temperature in germanium is $2.37\times10^{19}/m^3$. If the electron and hole mobilities are 0.38 and 0.18 $m^2V^{-1}s^{-1}$, respectively. Calculate the resistivity of the intrinsic germanium.	(A)

17. An intrinsic semiconductor material A has an energy gap 0.36 eV while material B has an energy gap 0.72 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. (A)

18. Calculate the intrinsic concentration of charge carriers at 300 K. Given that me* =0.12 m0, mh*=0.28 m0 and the energy gap of germanium at 300 K is 0.67 eV. (A)

(2 x 6 = 12)

PART C

Answer any 2 questions **Weights: 5**

19. A particle of mass m is confined in a field free region between impenetrable walls at x=0 and x=a. Find the stationary energy levels of the particle. Discuss the physical significance of the wave function. (An)

20. Briefly explain (i) Domain theory of ferromagnetism (ii) Explain magnetic hysteresis in the case of ferromagnets? (A)

21. Discuss the thermal conductivity in crystalline material. Briefly discuss Normal and Umklapp process with the help of a diagram. (An)

22. Discuss the extended, reduced and periodic zone scheme of Brillouin zone representations? Also briefly explain the construction of Brillouin zones in one and two dimensions? (An)

(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;