

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2024

M.Sc- 3rd Semester (PMS)

COURSE CODE (CREDITS): 18MS1PH313

MAX. MARKS: 35

COURSE NAME: CONDENSED MATTER PHYSICS- II

COURSE INSTRUCTORS: SKT

MAX. TIME: 2 Hours

Note: (a) All questions are compulsory.

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

Q.No	Question	CO	Marks
Q1.	(a) For $l= 2,1,0,-1,-2$ the spin arrangement of the two atoms are $\downarrow,\downarrow,\downarrow,\downarrow,\downarrow$ and $\downarrow\uparrow,\downarrow\uparrow,\downarrow\uparrow,\downarrow\uparrow,\downarrow\uparrow$ respectively. Calculate the ground state of specific ions. (b) Systematically show the precession of L, S and J vector around magnetic field B.		3+2=5
Q2.	A magnetic material is placed in uniform magnetic field, write down the modified Hamiltonian. Assume that momentum of electron get modified by vector magnetic potential as $p \rightarrow p + \frac{e}{c} \vec{A}$. Explain Paramagnetism and Diamagnetism by calculating change in the system energy using second order perturbation theory.		4+4=8
Q3.	(a) What is equilibrium distribution function of electrons in metals, and relaxation time approximation of electrons for conduction. (b) Consider the group of electrons in the nth band that find themselves at time t in the phase space volume element $dr dk$ about r and k. Calculate general formula for variation of distribution function $g(t)$ in terms of fraction of electrons that survives from t to t' without collision.		5+5=10
Q4.	Discuss the DC electrical conductivity, AC electrical conductivity and thermal conductivity on the basis of simplification of the non equilibrium distribution function.		2+2=4
Q5.	What is the difference between classical and Quantum Hall effect. Write the short notes on the integer quantum hall effect, fractional quantum hall effect.		2+3+3=8