

Mid-West University
Examinations Management Office

Birendranagar, Surkhet

End Semester (Alternative/Physical) Examinations -2078

Bachelor level/ B.Sc /6th Semester

Full Marks : 60

Time: 3hrs

Pass Marks : 30

Subject : Solid State Physics (PHY463)

Candidates are required to give their answer in their own words as far as Practicable. The figures in the margin indicate full marks.

Attempt all the questions

[6x10 = 60]

1. Discuss Kroning Penney model. Using the model show that the energy spectrum of electron consists of a number of allowed energy bands separated by forbidden regions.
2. Differentiate between diamagnetism, Para magnetism and Ferromagnetism with examples. Discuss the ideas of ferromagnetism and derive Curie- Weiss law
3. a) What are the various symmetry operations? Prove that five-fold axis of rotation is not compatible with a lattice. [5]
a) Differentiate between the type-I and type-II superconductors. What is phonon? Which statistics does it obey? [5]

OR

Differentiate between diamagnetism, Para magnetism and Ferromagnetism with examples. Discuss the ideas of ferromagnetism and derive Curie- Weiss law

4. a) What are assumptions of Einstein's theory of specific heat of solid? Derive relation for lattice heat capacity following Einstein model. [5]

b) Give an account of the origin of atomic magnetism. Which source is important in the case of ferromagnetic? When does an intrinsic semiconductor behave as an insulator? [5]

5. a) X-rays from a tube undergo first order reflection at a glancing angle of 12° from the face of a calcite crystal. The grating space of calcite is 3.04×10^{-8} cm. Calculate the wavelength of X-rays. At what angle will the third order reflection take place from the crystal? [5]

- b) Show that the kinetic energy of a three dimensional gas of N free electrons at 0 K is $E_o = \frac{3}{5} NE_f$. [5]

OR

- a) The critical field at 6K and 8K for a superconducting alloy are 7.616mAm^{-1} and 4.284mAm^{-1} respectively. Determine the critical temperature and critical field at 0K. [5]
 - b) A paramagnetic substance has 10^{28} atom/ m^3 . The magnetic moment of each atom is 1.8×10^{-23} A/ m^2 . Calculate the paramagnetic susceptibility at 300K. What would be the dipole moment of a bar of this material 0.1m long and 1 cm^2 cross- sections placed in a field of 8×10^4 A/ m^2 [5]
6. a) Obtain the eigenvalues and normalized wave functions for a particle in a one-dimensional infinite potential box of side 'L'. [5]
b) Give an account of classical theory of diamagnetism and derive and expression for susceptibility only classical theory. [5]

THE END