

NOV-2015  
M.Sc (Physics) Examination Semester – 3  
Phys – C303 Condensed Matter and Material Physics  
Paper code : 4705

Time 2Hrs 30 Min

Max Marks : 70

Attempt all questions. Figures to the right indicate marks

- Q. 1 [a] Explain the Generation and absorption of x-rays with diagram. [07]  
Q. 1 [b] What is Specific heat? Obtain an expression of specific heat capacity of a solid using Debye Model. [07]

OR

- Q. 1 [a] Define Brillouin zone, reciprocal lattice and steps to construct the reciprocal lattice. [07]  
Q. 1 [b] Calculate the interplanar spacing between two lattice planes which gives first order diffraction at an angle of 26.42 Angstrom with x-rays of wavelength 0.71 Angstrom. [07]

- Q. 2 [a] On basis of free electron theory, derive an expression for electrical and thermal conductivity in metals. [07]  
Q. 2 [b] With a schematic explain Hall – effect. [07]

OR

- Q. 2 [a] Differentiate between Fermi Surface and Brillouin zone. What inference do you draw from a spherical and ellipsoidal Fermi surface? [07]  
Q. 2 [b] Explain Nearly free electron model and tight binding model [07]

- Q. 3 [a] Write a detailed note on a Ferroelectricity. [07]  
Q. 3 [b] Explain Tunneling and Josephson effect in detail. [07]

OR

- Q. 3 [a] Explain the terms : (1)Dielectric constant (2) Polarizability (3) Ionic Polarizability (4) Dipolar polarizability (5) Electronic polarizability with proper example and necessary figures. [07]  
Q. 3 [b] Derive the Clausius-Mosotti relation. [07]

- Q. 4 [a] Write a brief note on Ferromagnetic substances. Explain and derive Weiss theory of ferromagnetism. [07]  
Q. 4 [b] Explain Ferro, Ferri and Antiferro magnetic order. What is Antiferro electric effect? [07]

OR

- Q. 4 [a] Explain Hysteresis loop. What is Curie Temperature? Explain Curie – Weiss law for susceptibility of ferromagnetic substances. [07]  
Q. 4 [b] Give the full form of NMR and Explain it in detail with it's applications. [07]

- Q. 5 [a] Write note on applications of Ferrofluid. [07]  
Q.5 [b] Explain any two synthesis techniques of Ferrofluid. State the importance of Surfactant in preparation of a Ferrofluid. [07]

OR

- Q. 5 [a] What is Ferrofluid? Write the brief note on Ferrofluid. Discuss any two physical properties of Ferrofluid. [07]  
Q. 5 [b] Explain the behavior of Ferrofluid when the magnetic field is applied to it. Explain the magnetic properties of Ferrofluid. [07]