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PG CBCS
M.Sc. Semester- III Examination, 2022
PHYSICS
PAPER: PHS 303A
(ADVANCED CONDENSED MATTER PHYSICS-I)

Full Marks: 40   **Time: 2 Hours**

GROUP-A

1. Answer any FOUR from the following questions: 4×2=8

a) Draw the first four bands for simple cubic lattice along [110] according to empty lattice approximation.

b) Explain how polarons are generated in ionic crystal.

c) Clearly describe what is meant by edge dislocation?

d) Explain why low temperature is required for Landau levels.

e) Why Schottky defects are inevitable in solids.

f) What is the mechanism of formation of a V-center?

GROUP-B

2. Answer any FOUR from the following questions: 4×4=16

a) What is Mott Metal-Insulator transition? Show how it is consistent with screened coulomb model?

b) What is Tight Binding Approximation? Find the bandwidth of simple cubic crystal along [110] direction according to Tight Binding Approximation.

c) Explain the detailed mechanism of thermo-luminance of solid.

d) Explain ionic polarization in the AC field, and hence find the relation of dielectric constant.

e) Find the expression of Frenkel defects of ionic crystals.

GROUP-C

3. Answer any TWO from the following questions: 2×8=16

a) Explain what is meant by De has Van Alphen Effect and find an expression of period of oscillation of mean energy of electrons near the Fermi surface.

b) What is polariton? Derive LST relation for an ionic crystal.

c) What is electrostatic screening? Derive Thomas Fermi dielectric function considering electrostatic screening in a metal.

d) Find an expression of conductivity in an ionic crystal and hence find the Einstein relation.

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