A-099

Total Pages : 3 **Roll No. ----------**

MPHY-506

Elementary Solid State Physics

M.Sc. Physics (MSCPHY)

2nd Semester, Examination 2024 (June)

Time: 2:00 hrs Max. Marks: 35

Note : This paper is of Thirty five (35) marks divided into Two (02) Section A and B. Attempt the questions contained in these sections according to the detailed instructions given therein. Candidates should limit their answers to the questions on the given answer sheet. No additional (B) answer sheet will be issued.

Section-A (Long-Answer-Type Questions)

Note : Section 'A' contains Five (05) long-answer-type questions of Nine and Half (9.5) marks each. Learners are required to answer any Two (02) questions only.

[2x9.5=19]

P.T.O.

Q.1. What do you understand by powder diffraction method? Explain any one factor affecting relative intensity of the diffraction lines.

Q.2. Derive the expression for equilibrium concentration of Schottky defects.

Q.3. Discuss the Kronig-Penny model for the motion of an electron in a periodic potential.

Q.4. What is the energy gap? With relevant theory, obtain a relation between energy gap and temperature in intrinsic semiconductor.

Q.5. Explain what are colour centres? Describe one method for creation of colour centres.

Section-B (Short-Answer-Type Questions)

Note : Section 'B' contains Eight (08) short-answer-type questions of Four (04) marks each. Learners are required to answer any Four (04) questions only.

[4x4=16]

Q.1. What is Hall effect? Give an elementary theory of Hall effect.

Q.2. Define a unit cell. Distinguish between primitive and non-primitive unit cells.

Q.3. Show that the number of Schottky defects n in a crystal of N lattice sites at temperature T is given by $n = Ne^{\left(\frac{-E_v}{2k_BT}\right)}$; N>>n where E_v is the energy of formation of a Schottky defect and k_B is Boltzman constant.

Q.4. What are lattice vacancies? Discuss Fick' law and explain diffusion constant.

Q.5. Distinguish between amorphous solids and glasses.

Q.6. Derive expressions for

(i) Electrical conductivity

(ii) Thermal conductivity on the basis of classical free electron theory.

Q.7. Explain the principle of LASER. Describe two applications of LASER.

Q.8. Explain free electron theory of metals.

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