CS/2110 5244/NH

Total No. of Sheets used ..... Total No. of Questions .....

Subject ..... Paper ..... A .....

Title of the Paper ..... Condensed Matter Physics .....

Time allowed ..... 3 hrs ..... Maximum Marks ..... 30 ..... Minimum Pass Marks .....

Note : The candidates are required to attempt two questions each from Section A & B Section C will be compulsory

Please assign marks to each question

Sec-A

Q1. (a) What is meant by symmetry operations in crystals? (2)

(b) Explain why a five fold symmetry of crystals are not possible. (3)

Q2. (a) Distinguish between primitive and non-primitve unit cell with the help of two dimensional diagram. (3)

(b) How is Wigner Seitz primitive cell drawn? (2)

Q3. What are Miller Indices? Obtain Miller Indices of a plane having intercepts of 3a, 5b/2 and ∞ on the crystallographic axes, where a, b and c are primitive vectors of the crystals. (5)

Q4. Draw the crystal structure of Diamond and describe fully. Hence calculate its packing fraction. (5)

Sec-B

Q5. (a) What is geometrical structure factor and its expression? (2)

(b) Why 100 reflection is absent for BCC while 200 reflection is present? (3)

Q6. An X-ray beam of wavelength 1.54 A° is diffracted from the (110) plane of a solid with simple cubic lattice structure and lattice constant a= 4.62 A°. At what angle the first order of diffraction occur.

Q7. Discuss the various X-ray diffraction methods in brief. (5)

Q8. Derive Laue's equation for X-ray diffraction by crystals. How do these lead to Bragg's equation. (5)

Sec C

Q9. Attempt any five questions carrying 2 marks each.

(i) Define first Brillouine zone?

(ii) What is a crystal?

(iii) What are the dimensions of reciprocal lattice vectors?

(iv) What is advantage of rotating crystal method in diffraction?

(v) What is atomic scattreing factor?

(vi) Zinc has hcp structure. The height of unit cell is 0.49 c. The nearest neighbour distance is 0.27 nm. The atomic weight of zinc is 65.37. Calculate volume of unit cell and densityof zinc.

(vii) Write the expression for Bragg's law in reciprocal lattice.

2x5=10