[957] SEAT No._____ No. of Printed Pages : 02

SARDAR PATEL UNIVERSITY
M.Sc. (Physics)(IIIrd Semester) Examination
Date :25/03/2019, Day : Monday, Time : 10:00a.m. to 1:00 p.m.
Subject : Crystallography and Material Science, Paper No. PS03EPHY21
CBCS(choice based credit system)

Important Note : Q.1 : Multiple choice questions (MCQ) carries one mark each.
Q.2 : Short questions carries two marks each (attempt any seven out of nine)
Q.3 to Q.6 : Long questions carries 12 marks .

Total Marks : 70

Q.1 Choose the appropriate options from the following in Q.1 (8)

1 ---------- is the chemical formula for Rochelle salt
(a)$NaKC_4H_4O_6.4H_2O$ (b) $NaK_2C_4H_4O_6.4H_2O$ (c) $Na_2K_2C_4H_4O_6.4H_2O$
(d) $Na_2KC_4H_4O_6.4H_2O$

2 When reciprocal lattice point touches the surface of the Ewald sphere it represents
(a)direction (b) planes (c)point group (d) space group

3 The reciprocal lattice of a SC lattice is
(a) simple cubic lattice (b) BCC lattice (c) FCC lattice (d) HCP lattice

4 The equation that shows the decrease in scattered intensity as the inverse square of the distance from the scattering electron is called
(a)Compton (b) Thomson (c) Bragg's (d) Rayleigh

5 Which of the following is the example of high temperature superconductor ?
(a)YBCO (b) GaAs (c) Si (d) Ge

6 A system of interacting fermions is termed as
(a) Fermi gas (b) Fermi liquid (c) Fermi solid (d) Fermi plasma

7 How many pentagons are there in C_{60} molecule ?
(a) 12 (b) 14 (c) 60 (d) 20

8. The mesogens obtained by heating solids is called
(a) lyotropic (b) thermotropic (c) amorphous (d) polymers

Q.2	**Answer any seven questions out of nine in Q.2**	**(14)**
1	How wavelength dispersive analysis differs from Energy dispersive analysis ?	
2	Define atomic scattering factor and structure factor.	
3	What do you understand by "Frozen in" transverse optical phonons ?	
4	What are quasi crystals ? Explain what is meant by penrose tiling.	
5	Define polarons and polaritons .	
6	How cholesteric phase differs from nematic phase of liquid crystal ?	
7	What Excitons ? Differentiate between Frenkel and Mott-Wannier exciton.	
8	Why the concept of reciprocal lattice is necessary to understand diffraction ?	
9	What is meant by gnomonic projection ? In which X-ray method it is being used.	
Q.3(a)	What are Laue Equations ? Explain equivalence of Bragg's law and Laue equations with proper equations.	**(6)**
Q.3(b)	Explain stereographic projection used for displaying the angular relationship between lattice planes and directions.	**(6)**
	OR	
Q.3(b)	How indexing of electron diffraction pattern for polycrystalline specimen is done ?	**(6)**
Q.4(a)	With appropriate equations explain scattering of X-rays by a unit cell.	**(6)**
Q.4(b)	What is meant by Polarization Catastrophe ? Explain it in detail .	**(6)**
	OR	
Q.4(b)	Discuss second order transition in a ferroelectric material.	**(6)**
Q.5(a)	Explain how electron-phonon interaction takes place in ionic solids.	**(6)**
Q.5(b)	Derive the expression for Lydanne-Sachs-Teller (LST) relation.	**(6)**
	OR	
Q.5(b)	In which phenomena Hall resistivity remains constant at certain values of gate voltage in a two dimensional system ? Explain it in detail.	**(6)**
Q.6(a)	Explain switching and Xerography applications of amorphous semiconductors.	**(6)**
Q.6(b)	How nanofluids can improve heat transfer process, discuss by considering different plots of thermal conductivity, heat capacity and dynamic viscosity as a function of particle volume fraction ?	**(6)**
	OR	
Q.6(b)	Classify polymers and explain the effect of temperature on it.	**(6)**

— X —