Exam Seat No:_____ Enrollment No:_____

C.U.SHAH UNIVERSITY
Wadhwan City

Subject Code 5SC02PHC3   Summer Examination-2014   Date: 13/06/2014

Subject Name:- **Solid State Physics**

Branch/Semester:-   M.Sc(Physics)/II   Time:02:00 To 5:00

Examination: Regular

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Instructions:-

(1) Attempt all Questions of both sections in same answer book / Supplementary

(2) Use of Programmable calculator & any other electronic instrument is prohibited.

(3) Instructions written on main answer Book are strictly to be obeyed.

(4) Draw neat diagrams & figures (If necessary) at right places

(5) Assume suitable & Perfect data if needed

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SECTION-I

Q-1	a)	Define: Non bravais lattices.	(01)
	b)	Define: Unit Cell.	(01)
	c)	Define: Forbidden region.	(01)
	d)	Name any four Point defects.	(01)
	e)	Define: Colour centers.	(01)
	f)	What are Primitive and non primitive cells?	(01)
	g)	To which axis is the miller plane (0 1 1) parallel?	(01)
Q-2	a)	State and prove the Bloch theorem for periodic potentials.	(05)
	b)	Write a short note on Fick's law of diffusion.	(05)
	c)	Discuss and derive Bragg's law.	(04)

OR

Q-2	a)	Describe the line imperfections.	(05)
	b)	Explain "Hass Van Alfen Effect" and "Cyclotron resonance in solids".	(05)
	c)	If the average energy required to create vacancy in a metal is 1eV, calculate the ratio of vacancies in metal at 1000 K and at 500 K.	(04)

Q-3	a)	What are Miller indices? Illustrate the steps to get miller indices for a crystal plane. Draw (0 1 1) & ($\bar{1}$ 0 0) miller planes.	(07)
	b)	Describe various techniques of X-ray diffraction. Give detailed account of the powder diffraction technique with suitable example.	(07)

OR

Q-3	a)	Explain Frenkel defects in ionic solids; interstitial impurity in metals and Non stoichiometry.	(07)
	b)	Explain the tight binding approximation method for energy band calculation. Obtain the width of the first allowed band in simple cubic lattice.	(07)

SECTION-II

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Q-4 a) What is Slater's criterion? (01)

b) Define: Ferromagnetic magnons. (01)

c) What is multiplicity? (01)

d) Write the equation formula of curie constant. (01)

e) Define: Isotope effect. (01)

f) What are high temperature superconductors? (01)

g) Define penetration depth. (01)

Q-5 a) Define Superconductivity and Meissner effect. Prove that zero resistance and perfect diamagnetism are two necessary but independent properties of superconductors. (05)

b) Calculate the critical current for a Super Conducting wire of lead having a diameter of 1 mm at 4.2 K. critical temperature (Tc) for lead is 7.18 K and $H_{c(0)} = 6.5 \times 10^4$ A/m at 0 K . (05)

c) Give the brief classification of magnetic materials. (04)

OR

Q-5 a) Explain Type-I and Type-II superconductors with suitable examples. (05)

b) Explain quantum theory of Para-magnetism. (05)

c) Discuss D.C. and A.C. Josephson effect. (04)

Q-6 a) Explain S.Q.U.I.D. giving principle, construction, working and applications. (07)

b) Derive an expression for diamagnetic susceptibility of solids using classical approach. (07)

OR

Q-6 a) Discuss in detail: the B.C.S. theory and its outcomes. (07)

b) Explain Weiss' molecular field theory. (07)

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