T.Y.B.SC. SEM – V (2014 COURSE) : WINTER - 2017

SUBJECT : SOLID STATE PHYSICS

Day : Friday
Date : 27/10/2017

Time : 3:00P.M.TO 5:00 P.M.
Max. Marks : 40.

W-2017-0650

N.B.:

1) All questions are **COMPULSORY.**
2) Figures to the **RIGHT** indicate full marks.
3) Draw neat labeled diagrams **WHEREVER** necessary.

Q.1 Attempt any **TWO** of the following: **(10)**

a) What do you mean by FCC, BCC, SC structures Find out the coordination number these structure.
b) What is Hall Effect? Explain the application of this effect?
c) Describe powder method for determination of crystal structure.

Q.2 Attempt any **TWO** of the following: **(10)**

a) Derive an expression for lattice heat capacity using classical theory of lattice heat capacity.
b) Explain Bragg's law for X–ray diffraction in crystal.
c) Describe the crystal structure of NaCl and CsCl with the help of neat diagram.

Q.3 Attempt any **TWO** of the following: **(10)**

a) Explain the basis of band theory and describe the formation of energy band in solids.
b) What is reciprocal lattice? Show that FCC lattice is the reciprocal of BCC lattice.
c) Show that the total energy of free electron gas at 0^0K is $\frac{3}{5}NE_f$.

Q.4 Attempt any **FIVE** of the following: **(10)**

a) What do you mean by term "unit cell"?
b) State different symmetry operations.
c) Define i) Lattice ii) Co-ordination number
d) What do you understand by crystal as a grating for X-ray?
e) A plane has intercepts on the three axis a, b, c at 3a, 2b, 5c respectively. What are its miller indices?
f) Calculate the distance between two lattice planes which give first order diffraction at an angle of 26.42 degree with Molybdenum X-ray of wavelength 0.75 A^0.
g) For the elastic continuum the number of modes of vibrations is given by

$$Z(v)dv = 4\pi V v^2 \left(\frac{2}{C_t^3} + \frac{1}{C_l^3}\right) dv,$$ explain the notation used.

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