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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
FINAL EXAMINATION
SUMMER SEMESTER - JUNE-JULY 2016
B.Tech. II Semester

COURSE CODE: 10B11PH211 MAX. MARKS: 50
COURSE NAME: PHYSICS II
COURSE CREDITS: 04 MAX. TIME: 2 Hrs

Note: *All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means. Scientific calculators are allowed.*

Section-A [2 × (4×2) = 16 Marks]

Q1.(a) Obtain the relation between the density of crystal material and lattice constant in a cubic lattice.

(b) Calculate the value of Madelung constant for a 3D NaCl lattice.

(c) Show that a body centered cubic lattice is more densely packed than a simple cubic lattice.

(d) Obtain an expression for the interplanar spacing for a crystal lattice.

Q2.(a) State Ampere's Law. Also, discuss the Maxwell modification.

(b) Analyze the two cases: (i) $\vec{\nabla}.\vec{R} = 0$, and (ii) $\vec{\nabla} \times \vec{P} = 0$.

(c) Find the gradient of $r = \sqrt{x^2 + y^2 + z^2}$, where $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$

(d) What is the Laplacian operator? How it is useful?

Section-B [(6 × 5) = 30 Marks]

Q3.Derive Bragg's law for X-ray diffraction. Also explain it using the concept of reciprocal lattice.

Q4.Prove that the sum of the squares of the direction cosines of the direction angles of a vector in 3D space is unity.

Q5.The potential energy of a system of two atoms is given by, $U(R) = -\frac{\alpha}{R^4} + \frac{\beta}{R^{12}}$. Calculate the amount of energy released when the atoms form a stable bond. Determine the bond length.

Q6.Using spherical polar coordinates obtain the expression of the electric field due to a dipole.

Q7.State and prove Gauss theorem in electrostatics, and mention its significance. Also evaluate the form of Gauss theorem in material medium.

Q8.Check Stokes theorem using the function $\vec{A} = (2xy + 3y^2)\hat{y} + (4yz^2)\hat{z}$ for a square surface of unit length in the positive YZ-plane. Consider a corner of the square is located at the origin.

Section-C [1 × (2×2) = 4 Marks]

Q9.Write short notes (a) Hydrogen bonds (b) Poynting Theorem.