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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- May-2018

B.Tech. II Semester (ECE/CSE/IT)

COURSE CODE: 10B11PH211

MAX. MARKS:35

COURSE NAME: PHYSICS-II

COURSE CREDITS: 4

MAX. TIME: Two Hours

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

1. (a) Derive the relation for propagation of electromagnetic wave through free space and also prove that the velocity of the wave is 3×10^8 m/s in free space.
(b) Find the divergence and curl of E-Field, $E = (x - z^2)\hat{i} + x^2z\hat{k}$ at the point (2,0,-2).
(3+3)
2. (a) Consider an 8/125 single mode fiber operating at 1300nm with a loss of 0.8 dB/Km. The line width of the source is 0.013nm. Calculate the threshold power level for (i) Brillouin scattering and (ii) Raman scattering in the fiber. Also find the ratio of the Brillouin scattering threshold to the Raman scattering threshold.
(b) What is Micro and Macro bending? Calculate the critical radius of curvature for a Step index 50/125 fiber with NA of 0.2 operating at 850 nm.
(3+3)
3. (a) Explain Bragg's law of X-ray diffraction in crystals. Also discuss powder crystal method and rotating crystal method of X-ray diffraction.
(b) The glancing angle on a cubic plane (1 1 1) of NaI crystal ($a=0.2814$ nm) corresponding to first order diffraction maxima for X-rays of wave length 0.8 \AA .
(3+2)
4. (a) Derive an expression for the equilibrium spacing and cohesive energy of atoms in a solid.
(b) Find the potential energy of two particles in stable configuration for $m=1$ and $n=8$.
(3+2)
5. (a) Find the number of atoms per unit area in a simple cubic structure for the planes (1 0 0), (1 1 0) and (1 1 1).
(b) What do you understand by atomic packing density or packing factor in a crystal? Prove that the packing factor for bcc and fcc structures are $\sqrt{3}(\pi/8)$ and $\sqrt{2}(\pi/6)$ respectively.
(3+4)
6. (a) Show that the inter planer spacing of d_{111} is approximately 1.2 times the spacing d_{200} in lead, which has fcc structure. The radius of the atom is 0.1743 nm.
(b) What are Miller Indices? Obtain the Miller Indices with diagram of a plane which intercepts at $a, 2b, c/2$ in a simple cubic unit cell.
(3+3)