Dr. Dheeraj

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- May-2019

B.Tech. II Semester (ECE, CSE, IT, CE)

COURSE CODE: 18B11PH211 MAX. MARKS:35

COURSE NAME: ENGINEERINH PHYSICS-II

COURSE CREDITS: 3 MAX. TIME: Two Hours

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

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1. Sketch the vector function $V=\frac{\hat{r}}{r^2}$ and calculate its divergence. The answer may surprise you, carefully explain your answer. **(3)**
2. Find the electric field inside a sphere which carries a charge density proportional to the distance from origin as $\rho=kr$, where k is constant. **(3)**
3. Show that standing wave $f(z,t)=A\sin(kz)\cos(kvt)$ satisfies the wave equation and express it as the sum of a wave travelling to the left and a wave traveling to the right. **(4)**
4. (a) Write down in a tabular form the various microstates and macrostates of a system of 3 particles, arranged in 3 compartments, assuming (i) particles are indistinguishable (ii) particles are distinguishable.
   (b) Name three kinds of statistics. Explain the distinguishing features of MB, BE and FD statistics.
   (c) Assuming MB distribution of molecular speeds, derive an expression for average and most probable speeds. **(3+3+2)**
5. (a) Using FD statistics find the expression for Fermi energy and average kinetic energy of electrons at 0K.
   (b) Calculate Fermi energy of electrons in copper assuming that there is one free electron per atom. Given Avogadro's number $=6.02\times10^{23}$ atoms/mole, atomic weight of Cu =0.0635kg /mole, density = 8.94gram/cc, $h=6.63\times10^{-27}$erg-sec, mass of electron $m=9.1\times10^{-28}$ gram and Boltzmann constant k = 1.38x10-16 erg/°C. **(3+3)**
6. Explain Bragg's law of X-ray diffraction in crystals. Calculate the glancing angle on a cubic plane (1 1 1) of Sodium iodide crystal (a=0.2814 nm) corresponding to first order diffraction maxima for X-rays of wave length 0.8 Å. **(1+2)**
7. (a) Define space lattice. Name the seven types of crystal systems and give the relation of lengths of axes and the relation of angles between the axes of a unit cell of each type.
   (b) Describe the face centered cubic and hexagonal close packed structures. Calculate the atomic packing factor for both.
   (c) What are Miller indices? Discuss the steps to obtain the Miller indices for a particular lattice plane. **(3+3+2)**