Dr. Rajesh

Enrolment Number: .....

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -II EXAMINATION- April 2018
B.Tech II Semester (CSE, ECE, IT)

COURSE CODE: 10B11PH211 MAX. MARKS: 25
COURSE NAME: PHYSICS-II
COURSE CREDITS: 04 MAX. TIME: 1.5 Hrs

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

(CO-1)

1. What is Poynting vector? Derive Poynting theorem for the flow of energy of electromagnetic waves. **[1+4]**

(CO-2)

2. Draw a simple diagram to show all possible meaningful arrangements of three particles in three cells assuming that the particles obey. (i) M.B. Statistics, (ii) B.E. Statistics and (iii) F.D. Statistics. **[3]**

3. Eight distinguishable particles are distributed in two unequal compartments. The first compartment is divided into 4 cells and the second into 2 cells. Each cell is of equal a priori probability and there is no restriction on the number of particles that can be contained in each cell. Calculate the thermodynamic probability of the macrostates (8, 0) and (0, 8). **[2]**

(CO-3)

4. For O_2 gas at N.T.P calculate (i) $v_{m.p.}$ (ii) $\bar{v}$ and (iii) v_{rms} . Given Boltzmann's constant $K = 1.38\text{x}10^{-16}$ ergs/K. Avogadro's number= $6.02\text{x}10^{23}$/mole. **[3]**

(CO-4)

5. (a) Using the expression for Fermi-Dirac law of distribution of energy among electrons within a metal, prove that at 0K (i) the average kinetic energy $\bar{u} = 3/5\ u_f$ and (ii) the average velocity $\bar{v} = ¾\ v_f$, where u_f is Fermi energy and v_f is the velocity of electron at Fermi energy. **[3]**

(b) Calculate the Fermi energy of free electrons in copper assuming that there is one free electron per atom. Hence find the average energy per electron at 0K. Given Avogadro's number= $6.02\text{x}10^{23}$ atoms/mole; atomic wt of Cu = 63.5g. Mole^{-1}, density = 8.94 gm/cm^3, h = $6.63\text{x}\ 10^{-27}$ erg.sec and mass of electron m = $9.1\text{x}\ 10^{-28}$ gm. **[3]**

(CO-5)

6. (a) What is numerical aperture (NA) ? Drive the relation for NA for a step index fibre. **[2]**

(b) For a 25/90 step index fibre the refractive working at 820nm with n1= 1.47 and n2= 1.45. Calculate the V parameters and number of modes propagating at 820nm. How many modes will propagate if wavelength if changed from 820 to 1300nm. **[4]**