SPRING END SEMESTER EXAMINATION-2014

2nd Semester B.Tech/B.Tech Dual

PHYSICS-II PH-201

(Back-2012, 2011, 2010 Admitted Batches)

Full Marks: 60 **Time: 3 Hours**

Answer any SIX questions including Question No.1 which is compulsory.

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable and all parts of a question should be answered at one place only.

1. Answer any Ten from the followings. [2 × 10

a) What is ultra-violet catastrophe?

b) Why classical theory fails to explain photo electric effect?

c) Calculate the energy and momentum of a photon of wavelength 1Å.

d) Calculate the no of photons emitted per second from a 100 Watt sodium lamp of wavelength λ=6000Å.

e) What is stopping potential? In photo electric effect explain with diagram the variation of stopping potential with intensity.

f) State Heisenberg's uncertainty principle.

g) Show that the phase velocity (v_p) of a matter wave is greater than velocity of light.

h) What is the de-Broglie wavelength of an electron accelerated from rest through potential 1000 Volt?

i) Explain the physical significance of wave function $\psi(r,t)$.

j) Write the differences between conduction current and displacement current.

k) What is the physical significance of divergence of a vector or $\vec{\nabla}.\vec{A}$?

2. What are the Planck's assumptions on black body radiation? Derive Planck's distribution formula for black body radiation and establish Rayleigh-Jeans and Wein's formula. [1+5+1+1

3. Derive the expression for Compton shift in Compton Effect. Show that in Compton Effect electron can't be scattered at an angle grate than 90°. [5+3

4. What is normalized wave function? Establish time dependent and time independent Schrodinger equation. Show that electron can't be situated inside the nucleus. [1+5+2

5. Derive the expression for energy and wave function for a particle trapped inside one dimensional potential box of length L. Electrons with energy $2eV$ are incident on a potential barrier $12\ eV$ and 5Å wide. Find the transmission coefficient. [6+2

6. Derive Maxwell's equations in electromagnetism. Write the Maxwell's equation in its differential and integral form. [8

7. Establish Maxwell's electromagnetic wave equation in free space. Find the solution of electric field and magnetic field vector in free space. Show that Electromagnetic wave is transverse in nature. [1+3+4

8. Write short notes on the following : [2 × 4

a) Group velocity and Phase velocity

b) Quantum mechanical Tunneling

c) Graded index optical fiber

d) Application of Nano-material

x x x x x