

(Following Paper ID and Roll No. to be filled in your Answer Book)

**PAPER ID : 9611**

Roll No.

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**B. Tech.****(Second Semester) Carry Over Theory Examination, 2011-12****ENGINEERING PHYSICS-II**

Time : 2 Hours]

[Total Marks : 50

Note : Attempt questions from each Section as per directions.

**Section-A**

Attempt *all* parts of this question. Write answer of each part in short. Each part carries 2 marks 2×5=10

1. (a) Compare the wavelength of a photon and an electron if the two have same energy.
- (b) What was the Bragg's explanation about formation of Laue's spots in X-rays diffraction?
- (c) Define local field for dielectric materials.
- (d) Write two differences in propagation of an electromagnetic wave in free space and in conducting medium.
- (e) What are classifications of single walled Nanotube.

**Section-B**

Attempt any *three* parts of this question. Each part carries 5 marks. 5×3=15

2. (a) Calculate the wavelength of an electron that has been accelerated in a particle accelerator through a potential difference of 100 volt.
- (b) X-rays of  $1\text{Å}$  are scattered from a carbon block. Find the wavelength of the scattered beam in a direction of  $90^\circ$  with incident radiation, and kinetic energy imparted to the recoiling electron.
- (c) Find the polarization  $P$  in a homogeneous and isotropic dielectric material of relative permeability 4, when the electric displacement density  $D=2\times 10^{-8}\text{C/m}^2$ .
- (d) A quartz crystal of thickness 0.005 m is vibrating in resonant condition. Calculate the fundamental frequency. The Young's modulus and the density of quartz are  $7.9\times 10^{10}\text{Newton/m}^2$  and  $2650\text{kg/m}^3$  respectively.

- (e) A 1000 Watt monochromatic lamp radiating its power in all directions. Calculate the maximum value of electric field and magnetic field at a distance of 10 m from the lamp.

### Section-C

Attempt *all* questions of this Section. Each question carries 5 marks. 5×5=25

3. Attempt any one part of the following : 5×1=5
- (a) Derive the de-Broglie wavelength of a particle as function temperature.
- (b) Explain Heisenberg's uncertainty principle with example.
4. Attempt any one part, of the following : 5×1=5
- (a) Derive time independent Schrödinger wave equation for a particle wave and explain the physical significance of wave function.
- (b) What do you mean by Compton effect? Explain modified and unmodified radiations.
5. Attempt any one part of the following : 5×1=5
- (a) Explain briefly the different types of polarization in dielectrics.
- (b) What is hysteresis curve? Show that the area of this curve is equal to the hysteresis loss in each cycle.
6. Attempt any one part of the following : 5×1=5
- (a) Explain the concept of displacement current. How it makes the Ampere's law to valid for non-steady state. <https://www.aktuonline.com>
- (b) Derive and explain Poynting theorem. What do you understand by Poynting vector.
7. Attempt any one part of the following : 5×1=5
- (a) What are superconducting materials? Explain their classification as type-I and type-II superconductors.
- (b) What is nanotechnology? Give some important application of nanotechnology.

#### **Physical constants :**

Speed of light	$c = 3.0 \times 10^8 \text{ m/s}$
Planck's constant	$h = 6.62 \times 10^{-34} \text{ J-s}$
Mass of electron	$m = 9.1 \times 10^{-31} \text{ kg}$
Permeability	$\mu_0 = 4\pi \times 10^{-7} \text{ H/m}$
Permittivity	$\epsilon_0 = 8.854 \times 10^{-12} \text{ F/M}$