



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

**PAPER ID : 199206**

Roll No.

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## **B.Tech.**

(SEM. II) THEORY EXAMINATION, 2014-15  
**ENGINEERING PHYSICS-II**

Time : 2 Hours]

[Total Marks : 50

Note: Attempt questions from each section as per instructions.

### **SECTION - A**

1 Attempt all parts of this question. **5×2=10**

Each part carries 2 marks.

- (a) What do you mean by wave-particle duality?
- (b) What is Laue's X-ray diffraction?
- (c) Explain Meissner effect in superconductors.
- (d) What do you mean by equation of continuity?
- (e) What is dielectric constant?

## SECTION-B

2 Attempt any three parts of this question.

Each part carries 5 marks.

**5x3=15**

- (a) A particle confined to move along X-axis has the wave function  $\psi = ax$  between  $x=0$  and  $x=1$  and  $\psi = 0$  elsewhere. Find the probability that particle can be found between  $x= 0.35$  to  $x=0.45$ .
- (b) The transition temperature for lead is 7.26 K. The maximum critical field for the material is  $5 \times 10^5$  A/m. Lead has to be used as a superconductor subjected to a magnetic field of  $4 \times 10^4$  A/m. Find the temperature of lead and what precaution will have to be taken?
- (c) The dielectric constant of medium is 4. Electric field in the dielectric is  $10^6$  V/m. Calculate electric displacement and polarization. Take  $\epsilon_0 = 9 \times 10^{-12}$  F/m.
- (d) If the upper atmospheric layer of earth receives  $1360 \text{ W/m}^2$  energy from the sun, what will be the peak values of electric and magnetic fields at that layer?

- (e) An X-ray photon is found to have its wavelength doubled on being scattered through  $90^\circ$ . Find the wavelength and energy of the incident photon.  
(take  $m_0 = 9.0 \times 10^{-31}$  kg)

### SECTION - C

Attempt any one part of all the questions of this section.

Each question carries 5 marks.

**5x5=25**

- 3** (a) Describe the experiment of Davisson and Germer for the study of electron diffraction. What are the important conclusions that could be drawn from it?
- (b) Explain Heisenberg's uncertainty principle. Apply it to prove non-existence of the electron in the nucleus.
- 4** (a) What is hysteresis curve? Explain residual magnetism, coercive force and hysteresis loss.
- (b) Discuss the Langevin's theory for diamagnetic and paramagnetic materials.
- 5** (a) What is Poynting vector? Discuss the work-energy theorem for the flow of energy in EM field.
- (b) Discuss the propagation of EM waves in a free space.

- 6 (a) Explain superconductivity using BCS theory. Also discuss applications of superconductors.
- (b) What are buckyballs? How can the buckyballs be created? Where are these buckyballs used?
- 7 (a) Obtain Bragg's law for X-ray diffraction in crystals. Show how it can be experimentally verified.
- (b) Derive an expression for the energy of a particle confined in a one dimensional potential box.

**Physical Constants:**

|                            |  |
|----------------------------|--|
| Mass of electron           | $M_e = 9.1 \times 10^{-31} \text{ kg}$           |
| Speed of Light             | $c = 3 \times 10^8 \text{ m/s}$                  |
| Plank's constant           | $h = 6.63 \times 10^{-34} \text{ J-s}$           |
| Mass of Proton             | $m_p = 1.67 \times 10^{-27} \text{ kg}$          |
| Permeability of free space | $\mu_0 = 4\pi \times 10^{-7} \text{ H/m}$        |
| Permittivity of free space | $\epsilon_0 = 8.854 \times 10^{-12} \text{ F/m}$ |
| Avogadro 's number         | $N = 6.023 \times 10^{23} \text{ per mole}$      |

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