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EAS201

(Following Paper ID and Roll No. to be filled in your Answer Book)								
PAPER ID : 9611	Roll No.						-	

B. Tech.

(SEM. II) THEORY EXAMINATION 2010-11 ENGG. PHYSICS-II

Time : 2 Hours

Total Marks : 50

Note : Attempt all questions.

SECTION-A

1. Attempt all parts. All parts carry equal marks. (1×10=10)

(a) If the momentum of a particle is increased to four times, then the de-Broglie wavelength will become :

- (i) Twice (ii) Four Times
- (iii) Half

(iv) One-fourth.

- (b) The Compton shift depends on :
 - (i) Energy of incident radiation
 - (ii) Frequency of incident radiation
 - (iii) Angle of scattering
 - (iv) Material of target.
- (c) According to uncertainty principle which of the following particle can not exist in the nucleus :
 - (i) Electron (ii) Proton
 - (iii) Neutron (iv) Alpha-particle.

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- (d) For a given dielectric, as the temperature increases, the ionic polarizability:
 - (i) Increases
 - (ii) Decreases
 - (iii) First increases then decreases
 - (iv) Remain unchanged.
- (e) Above curie temperature, the hysteresis loop of a ferroelectric material merges into :
 - (i) Parabola (ii) Straight line
 - (iii) Ellipse (iv) Point.
- (f) Magnetic field can be produced due to :
 - (i) Moving charge
 - (ii) Time varying of electric field
 - (iii) Current
 - (iv) All the above
- (g) The energy per unit time, per unit area transported by the electromagnetic fields is expressed as :

(i)
$$\vec{S} = \frac{1}{\mu_0} (\vec{E} \times \vec{B})$$
 (ii) $\vec{S} = \mu_0 (\vec{E} \times \vec{B})$
(iii) $\vec{S} = (\vec{E} \times \vec{B})$ (iv) $\vec{S} = \varepsilon_0 (\vec{E} \times \vec{B})$

- (h) The property of the material which dose not show an appreciable change in superconducting state as compared to normal state is :
 - (i) Entropy (ii) Thermal conductivity
 - (iii) Volume (iv) Specific heat
- (i) The energy band gap of a superconductor is highest at :
 - (i) 0 K (ii) Transition temperature
 - (iii) Room temperature (iv) None of the above

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- (j) Armchair, zig-zag and chiral are the classifications of :
 - (i) Buckyballs
 - (ii) Multiwalled nanotubes
 - (iii) Doublewalled nanotubes
 - (iv) Singlewalled nanotubes

SECTION-B

2. Attempt any three parts of the following : (3×5=15)

- (a) Calculate the wavelength of an electron that has been accelerated in a particle accelerator through a potential difference of 100 volt.
- (b) A beam of gamma radiation having photon energy 510 keV
 is incident on an aluminium foil. Calculate the wavelength of scattered radiation at 90°.
- (c) If a NaCl crystal is subjected to an electric field of 1500 V/m and the resulting polarization is 4.3×10^{-8} C/m², calculate the relative permittivity of NaCl.
- (d) If the upper atmospheric layer of earth receives 1360 W m⁻² energy from the sun, what will be the peak values of electric and magnetic fields at the layer ?
- (e) A superconducting Lead has a critical temperature of 6.2 K at zero magnetic fields and a critical field of 0.0306 Tesla at 0 K. Determine the critical field at 3.1 K.

SECTION-C

- Note: Attempt all questions of this Section. All questions carry equal marks.
- 3. Attempt any one part of the following : (1×5=5)
 - (a) Derive the de-Broglie wavelength of a particle as function of temperature.

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- (b) What is Heisenberg's uncertainty principle ? Give its physical significance.
- 4. Attempt any **one** part of the following :

 $(1 \times 5 = 5)$

- (a) Derive time independent Schrödinger wave equation for a particle. What happens if the particle is free ?
- (b) What do you mean by Compton shift ? Explain that shift is not observable with visible light.
- 5. Attempt any one part of the following : (1×5=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 : $(1 \times 5 = 5)$
 - (a) Explain the concept of displacement current. How it makes the Ampere's law to valid for non steady state?
 - (b) Write down the Maxwell equations in conducting medium and use these equations to derive wave equations.
- 7. Attempt any one part of the following : (1×5=5)
 - (a) What are superconductors ? Explain their classification as
 type I and type II superconductors.
 - (b) What are carbon nanotubes ? Explain the CVD technique for its synthesization.

Physical constants : Speed of light Plank's constant Mass of electron Permeability Permittivity

c = 3.0×10^8 m/s h = 6.62×10^{-34} J-s m = 9.1×10^{-31} Kg $\mu_o = 4\pi \times 10^{-7}$ H/m $\epsilon_o = 8.854 \times 10^{-12}$ F/M

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