B TECH
(SEM-II) THEORY EXAMINATION 2017-18
ENGINEERING PHYSICS-II

Time: 3 Hours   *Total Marks: 100*

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1.   **Attempt *all* questions in brief.**   **2 x 10 = 20**

   a.   What will be the relation between wavelength of a photon and wavelength of a electron having same momentum?
   b.   What is wave-particle duality?
   c.   What do you understand by internal fields in liquids and solids?
   d.   Write two applications of ultrasonics.
   e.   State Heisenberg uncertainty principle.
   f.   Define Curie temperature of a ferroelectric material.
   g.   Write down mathematical form of equation of continuity and also give its physical importance.
   h.   Write the name of different types of single walled nanotubes.
   i.   What do you understand by nanomaterials?
   j.   Write the name of the experiment that confirm the wave nature of electron.

SECTION B

2.   **Attempt any *three* of the following:**   **10 x 3 = 30**

   a.   Determine the velocity and kinetic energy of a neutron having de-Broglie wavelength 1.0×10^{-10} m. Mass of neutron is 1.67×10^{-27} kg and h = 6.63×10^{-34} J-s.
   b.   Determine the percentage of ionic polarizability in sodium chloride which has the optical index of refraction and static dielectric constant 1.5 and 5.6 respectively.
   c.   If the earth receives 1.5 cal min^{-1} cm^{-2} solar energy. Calculate amplitudes of electric and magnetic fields of radiation?
   d.   For a specimen of superconductors, the critical fields are 1.4×10^5 and 4.2×10^5 A/m respectively for temperatures 14 K and 13 K respectively. Calculate the transition temperature and critical fields at 0 K and 4.2 K.
   e.   An electron is confined to move between two rigid walls separated by 10^{-9} m. Find the de-Broglie wavelengths representing the first three allowed energy states of the electron and corresponding energies.

SECTION C

3.   **Attempt any *one* part of the following:**   **10 x 1 = 10**

   (a)   Describe Compton's effect. Derive a relation for Compton's shift.
   (b)   Prove that group velocity of matter waves associated with a moving particle is equal to velocity of the particle.

4. **Attempt any *one* part of the following:** **10 x 1 = 10**

   (a)   Derive time dependent Schrodinger's wave equation for a matter wave. What would happen to this wave equation if the particle is free?

   (b)   Derive Claussius-Mossoti equation for cubic solid dielectrics.

5. **Attempt any *one* part of the following:** **10 x 1 = 10**

   (a)   Discuss different types of polarizability and polarization mechanism in dielectrics.

   (b)   Provethat magnetic susceptibility of dia-magnetic materials is negative and independent of temperature.

6. **Attempt any *one* part of the following:** **10 x 1 = 10**

   (a)   Explain the concept of displacement current and also derive all Maxwell equations in differential form.

   (b)   Derive Poynting theorem and explain its various terms.

7. **Attempt any *one* part of the following:** **10 x 1 = 10**

   (a)   What do you understand by Cooper Pairs? Discuss BCS theory for superconducting material.

   (b)   What is buckyballs? Discuss its creation and few applications.