Ref. No.: EX/IT/PHY/T/112/2018(S)

B. INFORMATION 1ST. YEAR 1ST. SEM. SUPPLEMENTARY EXAM. – 2018

PHYSICS – IA Time: 3 hours Full Marks: 100

Answer any five questions.

1. a) Calculate the de Broglie wavelengths of an electron having kinetic energy 13.6 eV and an iron ball having mass 50 gm and velocity 50 m/s.
   b) Prove that $[\hat{x}, \hat{p}] = i\hbar$.
   c) Write down the postulates of quantum mechanics.

   6+5+9=20

2. a) Write down the Schrodinger equation. When the probability density of the state is not function of time? Show this starting from the Schrodinger equation.
   b) Find the wave function of the particle confined under the potential $V(x) = 0$ for $0 < x < a$, and elsewhere $V(x) = \infty$.
   c) Then, find the position expectation value for the ground state of the particle.

   (2+6)+6+6=20

3. a) Write down the differential equation for a wave motion in two dimensions.
   b) What do you mean by coherence?
   c) Distinguish different classes of diffraction.
   d) Why the soap bubbles show colors by reflection of white light?
   e) Derive the radius of n-th dark ring in Newton ring experiment.
   f) If the gap between glass plate and convex lens is filled with water instead of air, will central spot remain same? Explain.

   2+2+3+3+7+3=20

4. a) Show that the small fluctuation of a system from the stable minimum of a potential generates a simple harmonic motion.