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**Y—111—2019**

**FACULTY OF SCIENCE**

**B.Sc. (Third Year) (Fifth Semester) (Backlog) EXAMINATION**

**NOVEMBER/DECEMBER, 2019**

**(CBCS Pattern)**

**PHYSICS**

**Paper XII**

**(Quantum Mechanics)**

**(Friday, 20-12-2019)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—2 Hours*

*Maximum Marks—40*

- N.B. :—*
- (i) All questions are compulsory.*
  - (ii) Figures to the right indicate full marks.*
  - (iii) All symbols have their usual meanings.*

1. Attempt any *four* : 8
  - (a) Write down an equation of energy in case of harmonic oscillator.
  - (b) Define 'operator' in wave mechanics.
  - (c) What is compton effect ? Explain.
  - (d) Write an expression for electron angular momentum.
  - (e) State Schrödinger's equation in steady state form.
  - (f) State an expression for quantized energy for a particle in one-dimensional box.
  
2. Attempt any *two* : 8
  - (a) Derive Schrödinger's equation in time independent form.
  - (b) Obtain different operators that corresponds to momentum and total energy.
  - (c) State and explain in detail the photoelectric effect.

P.T.O.

3. Attempt any *one* : 8
- (a) Derive time dependent form of Schrödinger's equation.
  - (b) Obtain an expression for Compton wavelength due to scattering of electron by photon.
4. Attempt any *two* : 8
- (a) Explain momentum quantization for a particle in one-dimensional box.
  - (b) Explain total and magnetic quantum numbers in brief.
  - (c) Explain wave functions of a particle in a box.
5. Attempt any *one* : 8
- (a) Set up Schrödinger's equation for H—atom in spherical polar co-ordinate system and separate the variables.
  - (b) Derive an expression for energy of a particle in three dimensional box.