BF—89—2016

FACULTY OF SCIENCE

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

OCTOBER/NOVEMBER, 2016

PHYSICS

Paper-XII (Phy-302)

(Quantum Mechanics)

(Saturday, 22-10-2016)   **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) Given data :

$h = 6.63 \times 10^{-34}$ J.s.

$m = 9.1 \times 10^{-31}$ kg.

1. Attempt any *four* :   8

    (a) Calculate de Broglie wavelength of an electron when it is accelerated through a potential difference of 100 V.

    (b) What is photoelectric effect ?

    (c) Write mathematical equation for momentum and energy operator.

    (d) Define probability current.

    (e) Write down an equation for energy of a particle in three-dimensional box.

    (f) State an expression for angular momentum associated with an electron in hydrogen atom.

2. Solve any *two* :   8

    (a) State and explain uncertainty principle.

    (b) Describe wave function of a particle.

    (c) Derive Schrodinger's equation in time dependent form.

P.T.O.

3. Solve any *two* : 8

 (*a*) Describe G.P. Thomson's experiment for the verification of De Broglie's hypothesis.

 (*b*) Derive an expression for the probability current of a particle moving along x-axis.

 (*c*) Explain eigen value and eigen function.

4. Solve any *one* : 8

 (*a*) Derive an expression for energy of a particle in one-dimensional box.

 (*b*) Starting from Schrodinger's equation for Hydrogen atom in spherical polar co-ordinate system, separate radial, azimuthal and zenith part by method of separation of variables.

5. Write short notes on any *two* : 8

 (*a*) Momentum quantisation when particle in one-dimensional box

 (*b*) Energy of a particle in three-dimensional box

 (*c*) Orbital quantum number

 (*d*) Electron probability density.