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R—89—2017

FACULTY OF SCIENCE

B.Sc. (Fifth Semester) EXAMINATION

MARCH/APRIL, 2017

PHYSICS

Paper XII (PHY-302)

(Quantum Mechanics)

(Thursday, 6-4-2017)   **Time : 10.00 a.m. to 12.00 noon**

Time—Two Hours   *Maximum Marks—40*

N.B. :— (i) *All* questions are compulsory.

     (ii) Figures to the right indicate full marks.

     (iii) Given data :

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

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

1. Attempt any *four* :   8

   (a) Explain DeBroglie's hypothesis of matter waves.

   (b) State uncertainty principle.

   (c) Define wave function.

   (d) Write Schrodinger's equation in time independent form.

   (e) Write wave function of a particle in one-dimensional box.

   (f) Write down an expression for angular momentum of an electron in a hydrogen atom.

   (g) Write an expression for energy and momentum operator.

2. Solve any *two* :   8

   (a) State and explain Compton effect.

   (b) Describe in detail G.P. Thomson's experiment.

   (c) With the help of uncertainty principle, show that electron is absent in the atomic nucleus.

P.T.O.

3. Solve any *two* : 8

    (*a*) Derive an expression for the Schrodinger's equation in time dependent form.

    (*b*) Derive an expression for probability current for free particle.

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

4. Solve any *one* : 8

    (*a*) Explain Energy quantization and momentum quantisation of a particle in one-dimensional box.

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

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

    (*a*) Separation of variables R, θ and ϕ in H-atom.

    (*b*) Orbital quantum number.

    (*c*) Magnetic quantum number.