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B—111—2019

FACULTY OF SCIENCE

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

MARCH/APRIL, 2019

(CBCS Pattern)

PHYSICS

Paper-XII

(Quantum Mechanics)

(Monday, 1-4-2019) **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.

(*iv*) Given data :

$h = 6.63 \times 10^{-34}$ J–s

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

1. Attempt any *four* : 8

(*a*) Write Schrodinger's wave equation for H-atom in spherical polar co-ordinates.

(*b*) State de-Broglie's hypothesis of matter waves.

(*c*) Write a note on principle-Quantum Number.

(*d*) State any *two* applications of Heisenberg's uncertainty principle.

(*e*) Write Schrodinger's wave equation in steady state form.

(*f*) Write the wave function of a particle in three dimensional box.

2. Attempt any *two* : 8

(*a*) On the basis of Heisenberg's uncertainty principle, show that electron is not present in the nucleus.

(*b*) Set up Schrodinger's wave equation in time dependent form.

(*c*) Write a note on Eigen value and Eigen functions.

P.T.O.

3. Attempt any *one* : 8

(*a*) Discuss the Compton effect. Derive an expression for Compton shift of wave length due to scattering of electron by photon.

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

4. Attempt any *two* : 8

(*a*) Explain orbital quantum number.

(*b*) Explain momentum quantization of a particle in one dimensional box.

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

5. Attempt 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.