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SB—39—2022

FACULTY OF SCIENCE

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

JUNE/JULY, 2022

(CBCS/Old Pattern)

PHYSICS

Paper XII

(Quantum Mechanics)

(Friday, 10-6-2022) **Time : 10.00 a.m. to 12.30 p.m.**

Time—2½ *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 :

$h = 6.63 \times 10^{-34}$ Js

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

1. Derive Schrödinger's equation for H-atom in spherical-polar co-ordinate system and separate the variables. 15

Or

(*a*) Derive an expression for Schrödinger's equation in time dependent form. 8

(*b*) Derive an expression for probability current for a free particle. 7

P.T.O.

2. Describe G.P. Thomson's experiment for the verification of matter waves. 15

Or

(*a*) Derive an expression for energy of a particle in a three-dimensional box. 8

(*b*) Write a note on Momentum-quantization, when particle exists in one-dimensional box. 7

3. Attempt any *two* : 10

(*a*) Calculate de-Broglie wavelengths of an electron, when it is accelerated by a potential differences of 80 V and 100 V separately.

(*b*) Explain Eigen values and Eigen functions.

(*c*) Write a note on particle in one-dimensional box wave function.

(*d*) Explain total quantum number and spin quantum number.