This question paper contains **2** printed pages]

LB—41—2023

FACULTY OF SCIENCE

M.Sc. (First Year) (Second Semester) EXAMINATION

APRIL/MAY 2023

(CBCS/New Pattern)

PHYSICS

Paper-PH-201

(Quantum Mechanics)

(Thursday, 4-05-2023) **Time : 10.00 a.m. to 1.00 p.m.**

Time— Three Hours *Maximum Marks*—75

N.B. :—*All* questions are compulsory and carry equal marks.

1. Derive expressions for time dependent and time independent Schrodinger's equations. 15

Or

(*a*) Write any *four* postulates of Quantum mechanics. 15

(*b*) Define Dirac-Delta function and write any *five* properties of it.

2. Find the eigen values of total angular momentum operator j^2 and Jz. 15

Or

(*a*) Prove the following commutation relation. 15

(*i*) $[\sigma_x, \sigma_y] = 2i\sigma_z$.

(*ii*) $[\sigma_x, \sigma_y] = -2i\sigma_y$.

(*b*) Explain reflection invariance and Parity.

3. What is WKB approximations one-dimensional case and hence find turning point. 15

P.T.O.

Or

(*a*) Explain second order perturbation for time dependent pertubation theory. 15

(*b*) Explain in brief adiabatic and sudden approximation.

4. Write in brief scattering by perfectly rigid sphere and scattering by a square well. 15

Or

(*a*) Explain scattering by a square well potential.

(*b*) Derive an expression for differential scattering cross-section.

5. Write short notes on any *three* (Each carries 5 marks) : 15

(*i*) Ket and bra notations.

(*ii*) Clebsch-Gordan coefficient.

(*iii*) Fermi-Golden Rule.

(*iv*) Starter's Determinant.