

# Jashore University of Science and Technology

## Department of Physics

### Bachelor of Science with Honours in Physics

1st semester of 3rd year, Academic session: 2023–2024

Course no.: PHY 3103

Course title: Quantum Mechanics I

Class test no.: 01

Date: July 14, 2025

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1. Which of the following wave functions cannot be solution of Schrödinger equation for all values of  $x$ ? [5]

(a)  $\psi = A \cos x$

(e)  $\psi = Ae^{-x}$

(b)  $\psi = A \tan x$

(f)  $\Psi = Ae^{-i(Et - xp_x)/\hbar}$

(c)  $\psi = A(\cos x) \cdot (\tan x)$

(g)  $\psi = Axe^{-x^2}$

(d)  $\psi = A x \sin(x)$

(h)  $\psi = A \ln(1 + 5x)$

2. What is the uncertainty relation between position and momentum? Explain its significance. Show that the uncertainty relation hold dimensionally. [5]

3. A wave function has the value  $\psi(x) = A \sin x$  in the region  $0 < x < \pi$  and zero elsewhere. (a) Normalize the wave function. (b) Find the probability that the particle is between  $x = 0$  and  $x = \pi/2$ . [6]

4. Write down the postulates of quantum mechanics. [4]