JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- MAY-2023

COURSE CODE(CREDITS): 3 MAX. MARKS: 25

COURSE NAME: Advance In Nanotechnology (16P1WPH211)

COURSE INSTRUCTORS: Dr. Santu Baidya MAX. TIME: 1 Hour 30 Minutes

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Note: *All questions are compulsory. Marks are indicated against each question in square brackets.*

Q1) Discuss the types of Nanomaterials in short points by points. Show that, for the wavefunction $\Psi(x) = \frac{1}{\sqrt{2a}}$; $|x| < a$

$= 0$; $|x| > a$; the uncertainty in momentum is infinite. [2+3]

Q2) What is a nanotube and what are their applications (Answer in short point by point)? A particle of mass m moves freely in a rectangular box with impenetrable walls. If the dimension of the box are $2a_x$, $2a_y$ and $2a_z$, derive expressions for the solution of Schrodinger equation and the corresponding energies. [2+3]

Q3) What is a quantum dot and what are their applications? [5]

Q4) A particle moving in one dimension has a state function $\psi(x) = \frac{1}{(2\pi\Delta^2)^{1/4}} \exp\left(-\frac{x^2}{4\Delta^2}\right)$, where Δ is a constant. Show that the state function is correctly normalized. [5]

Q5) A system is in a state $\psi(x) = \phi_{lm}$, an eigenstate of the angular momentum operators L^2 and L_z. Calculate $< L_x >$. [5]