JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -2 EXAMINATION- 2025
B.Tech-I Semester (CSE/IT/ECE/CE)

COURSE CODE (CREDITS): 18B11PH211 (3) MAX. MARKS: 25
COURSE NAME: Engineering Physics-II
COURSE INSTRUCTORS: PBB, SKK, VSA, SKT, HAZ, SBD, HSR MAX. TIME: 1 Hour 30 Min

Note: *(a) All questions are compulsory.*
(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

Q.No	Question	CO	Marks
Q1	Calculate the work function, stopping potential, and maximum velocity of photoelectrons for light of wavelength 4350 Å when incident on a sodium surface. Consider the threshold wavelength of photoelectrons to be 5420 Å.	1	3
Q2	The wave function of a certain particle is $\Psi = A\cos^2 x$ for $-\pi/2 \le x \le \pi/2$. Find the value of A. Also, find the probability that the particle will be found between x = 0 and x = $\pi/4$.	2	3
Q3	Find the expectation value <x> of the position of a particle trapped in a box of width L.	2	2
Q4	Radial probability density for the hydrogen atom is given by $4\pi r^2 \lvert R(r)\rvert^2$. Assume the radial wavefunction for the ground state as $R(r) = \frac{a_o^{-3/2}}{\sqrt{\pi}} e^{-r/a_o}$. Calculate the most (maximum) probable radius for the ground state.	5	2
Q5	Derive the Maxwell-Boltzmann distribution law for distinguishable particles in classical statistics.	4	5
Q6	(a) Consider a distribution of two particles in two boxes. Apply the criteria of distinguishable/indistinguishable particles, and present all possible schematic distributions of these particles in boxes for MB, BE and FD statistics. (b) Eight distinguishable particles are distributed in two compartments of unequal sizes. The first compartment is further subdivided into 6 cells and second into 2 cells of equal sizes. Calculate the probability of macrostates (6,2) and (4,4).	4	3 3
Q7	A particle of energy E is incident on the finite step barrier of height U (E < U). Calculate and plot the probability of finding the particle within barrier for two barrier heights U_1 and U_2, where $U_1 > U_2 > E$.	5	2
Q8	The wave function of a harmonic oscillator ground state is given by $\psi(x) = \left(\frac{\alpha}{\pi}\right)^{\frac{1}{4}} e^{\frac{-\alpha x^2}{2}}$, $\alpha = \sqrt{\frac{km}{\hbar^2}}$; Calculate the maximum permitted value of x (*position*) for the oscillator in the classically allowed region.	2	2

m_e=9.1x10^{-31} kg; h=6.626x10^{-34} Js; c=3x10^8 m/s;