University School of Automation and Robotics
GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY
East Delhi Campus, Surajmal Vihar
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http://ipu.ac.in/eastcampusmain.php

Subject Name: Engineering Physics-II **Max Marks: 30**
Subject Code: BS-108 **Duration: 1hr**

Mid Term
2nd Semester Examination
June 2022

Q1. Attempt any five parts in all from the following: **(2 X 5 = 10 marks)**

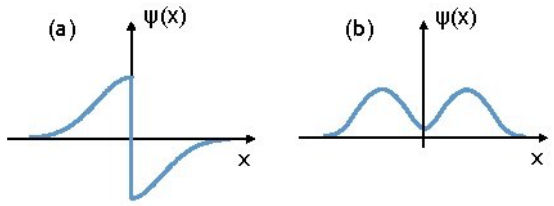
a) Are de Broglie waves known as electromagnetic in nature? Support your answer with a reason.
b) What are the drawbacks of Schrodinger wave equation?
c) Which is better for viewing nano-sized sample, electron microscope or optical microscope? Why?
d) An electron and a photon have same de-Broglie wavelength. Which one will have more energy?
e) Why the quantum number n=0 is not possible in one 1-D box?
f) What is a zero-point energy of a harmonic oscillator? Draw energy level diagram depicting equi-spaced levels.
g) Can every physical system be described by the time independent Schrodinger equation? Comment.
h) What is physical significance of fermi level and fermi energy?

Q2. **(5+3+2=10 marks)**

a) What is group velocity and phase velocity? Show that the group velocity of particle is equal to the velocity of the particle. **(5 marks)**
b) Derive the distribution function for Bose-Einstein statistics. **(3 marks)**
c) Differentiate between Fermions and Bosons. **(2 marks)**

OR

a) Obtain normalised wave functions for a particle in a box. Represent them graphically. **(5 marks)**
b) Obtain an expression for the statistical distribution function for Fermion particles. **(3 marks)**
c) Which of the following functions be acceptable wavefunctions? Give reasons for your answer. **(2 marks)**



Q3. **(3+3+4= 10 marks)**

a) Find the expectation value <x> of the position of a particle trapped in a box L cm. **(3 marks)**

b) Electrons with energies of 1eV and 2eV are incident on a barrier 10.0eV high and 0.50nm wide. Find their respective transmission probabilities. State, how are these affected if the barrier is doubled in width. **(3 marks)**

c) A photon with wavelength l is absorbed by an electron confined to a box. As a result, the electron moves from state n=1 to n=4. (a) Find the length of the box. (b) What is the wavelength of the photon emitted in the transition of that electron from the state n=4 to the state n=2? **(4 marks)**