University of Tehran
Department of Electrical and Computer Engineering

Modern Physics – Dr. Mohammad Abdolahad

Spring 2023

Problem Set 1: Particle-like Properties of The Electromagnetic Radiation

Due Date: 2023.05.06

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1. Consider the time-independent Schrödinger equation. As mentioned in the course, the analytical solution of this equation for common potentials is difficult. Given the difference between this equation and other partial differential equations, which method would you suggest for numerically solving this equation? Please explain your proposed method in full detail.

2. Using the method you proposed in response to question 1, numerically solve the Schrödinger equation for a particle in a box with a width of 1 Å. Plot the obtained wave function for the first and twenty-fifth energy levels in a single figure. Also, plot the energy diagram as a function of the wave number for the first 100 energy levels, both numerically and analytically, and compare the results. Analyze the outcome.

Please upload the explanations and the required outputs in a PDF file, along with the code used in MATLAB in txt format, compressed in a file, to the system.