

Menofia University

Faculty of Science

Subject: Quantum Mechanics (diploma)

Time allowed: 2 hrs Date of exam: - 12 - 2018

Answer the following questions

1. Find the energy eigenvalues and eigen functions of a particle moving in three-dimensional box of dimensions $2a \times 2b \times 2c$. Discuss degeneracy in this problem.

(60)

2. a. Define: the wave function, the eigen function, the eigen value, the eigen value equation, the compatibility, Hermitian operator.

b. Prove that the energy of the harmonic oscillator is quantized.

(60)

3. Prove that:

- a. The eigenvalue of a Hermitian operator is real.
b. The compatible operators are commute.
c. The expectation value is the mean value of measurements.
d. The momentum and kinetic energy operators are Hermitian operators.
e. The position of a particle and its momentum cannot be measured at the same time.

(60)