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Reg. No.....

Name.....

M.Sc. DEGREE (C.S.S.) EXAMINATION, JUNE 2019

Second Semester

Faculty of Science

Branch II—Physics-(A)-Pure Physics

PH2C06—QUANTUM MECHANICS—I

(2012 Admission onwards)

Time : Three Hours

Maximum Weight : 30

Part A (Short Answer Type Questions)

*Answer any **six** questions.*

Each question carries weight 1.

1. Give Dirac notation for state vectors.
2. Differentiate between eigen vectors and eigen values.
3. Illustrate the operation of an antihermitian operator.
4. Bring out the matrix elements of an operator.
5. What is meant by creation operator ?
6. Briefly explain Ehrenfest's theorem.
7. What is meant by energy eigen ket ?
8. What are Pauli spin matrices ?
9. Briefly explain WKB approximation.
10. Give the principle of variational method.

(6 × 1 = 6)

Part B

*Answer any **four** questions.*

Each question carries weight 2.

11. Bring out the significance of Heisenberg commutation relations.
12. Obtain the expectation values of x^2 and p for a Gaussian wave packet.

Turn over





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13. Distinguish between Schrödinger picture and Dirac picture.
14. Discuss the properties of the harmonic oscillator Eigen functions.
15. Bring out the fundamental commutation relations of angular momentum.
16. Discuss Stark Effect as degenerate case of perturbation.

(4 × 2 = 8)

Part C

Answer all questions.

Each question carries weight 4.

17. (a) Discuss the operators and properties in general for QM formulation.

Or

- (b) Describe the general uncertainty relations and further developments in QM.

18. (a) Describe the time evolution operator and its properties. Illustrate the application of time development operator.

Or

- (b) Obtain the Heisenberg picture and equations of motion.

19. (a) Bring out the commutation relations and eigen values for J^2 and J_x .

Or

- (b) What are CG co-efficients ? Obtain CG co-efficients for two spin half particles.

20. (a) Discuss hydrogen atom for WKB approximation .

Or

- (b) Describe anharmonic oscillator with perturbation theory.

(4 × 4 = 16)

