

SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN  
(AUTONOMOUS)

(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)  
Chromepet, Chennai — 600 044.

M.Sc.(Physics) END SEMESTER EXAMINATIONS NOVEMBER - 2023

SEMESTER - I

**22PPHCT1003 - Quantum Mechanics - I**

Total Duration : 2 Hrs. 30 Mins.

Total Marks : 60

### Section B

Answer any **SIX** questions ( $6 \times 5 = 30$  Marks)

1. Interpret the postulates of quantum mechanics.
2. Derive an expression for energy values and normalised wave functions for a particle in one dimensional box.
3. Describe the Heisenberg's picture briefly.
4. Illustrate Spin and Pauli matrices.
5. Compute the time independent perturbation theory for degenerate level.
6. Explain the terms parity and time reversal.
7. Evaluate the following commutation relations  $[J^2, J_+]$ ,  $[J_+, J_-][J_x, J^2]$ ,  $[J_z, J_-]$ .
8. Determine the time independent perturbation theory for non degenerate level for first order only.

### Section C

I - Answer any **TWO** questions ( $2 \times 10 = 20$  Marks)

9. State and prove Ehrenfest's theorem in detail.
10. Solve the radial equation to obtain the energy values of the hydrogen atom.
11. Determine the C. G. coefficients for  $J_1 = 1/2$  and  $J_2 = 1/2$
12. Criticize the symmetries and conservation laws in detail.

II - Compulsory question ( $1 \times 10 = 10$  Marks)

13. Explain about WKB approximation method in detail.

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