BR-2523
M. Sc. (Second Semester) Examination,
April-May, 2018
PHYSICS
Paper : Third
(Quantum Mechanics-II)
Time Allowed : Three hours Maximum Marks : 40

Note : Attempt questions of all two sections as directed. Distribution of marks is given with sections,

Section-'A'
(Short Answer Type Questions)   5x3=15

Note : Attempt all five questions. Each question carries 3 marks. Answer should not exceed 100 words.
1. Explain exchange degeneracy.

Or

Write note on polarizability of hydrogen.
2. Explain sudden approximation and prove that the wave function does not change while the Hamiltonian is changing

Or

Is the WKB method applicable to the potential-well problem.
3. What are identical particles?

Or

What is Pauli's exclusion principle?
4. Discuss the dipole selection rule.

Or

What is poynting vector? Deduce an expression for it.
5. Explain collision of identical particles.

Or

What is spin angular momentum?

Section-'B'
(Long Answer Type Questions) 5x5=25

Note : Attempt all five questions. Each question carries 5 marks. Answer should not exceed 800 words.
6. Describe the method of variation of constants as used in time dependent perturbation. Explain the method with suitable example.

Or

Describe the Vander Waal's (Long range) interaction between two hydrogen atoms in their ground state.
7. Use WKB method to illustrate the problem of alpha decay of radio-active nucleus.

Or

Describe the time dependent perturbation theory and find the condition for a real transition.
8. How do you define states in to singlet and triplet states for a two electrons system?

Or

Verify that pauli operators x and P_x satisfy the following relation.

$$xp_x - p_x x = i\hbar$$

9. Derive the expressions of transition probabilities for absorption and emission.

Or

Explain the followings :
(i) Electric dipole approximation, and
(ii) Forbidden Transition
10. Using variational method find the energy values of normal state of helium.

Or

Describe WKB method for the solution of Schrödinger wave equation in a potential field and discuss its validity.