

PC – 368 CV-19
(523) M.Sc. Physics (Third Semester)
Examination Dec-2020
Compulsory/Optional
Quantum Mechanics-II
Group -
Paper - I

Time : Three Hours]

[Maximum Marks : 80
[Minimum Pass Marks : 29

नोट : दोनों खण्डों से निर्देशानुसार उत्तर दीजिए। प्रश्नों के अंक उनके दाहिनी ओर अंकित हैं।

Note : Answer from both the Section as directed. The figures in the right-hand margin indicate marks.

Section-A

1. Answer the following questions:

- (a) In which situation W.K.B. method is used?
- (b) Is quantum tunneling possible?
- (c) What is harmonic perturbation?
- (d) What do you mean by perturbation theory?
- (e) How do you know what type of collision you have?
- (f) What is meant by scattering amplitude?
- (g) Give an application of screened coulomb potential.
- (h) What does relativistic mean in Quantum Physics?
- (i) What is an antisymmetric function?
- (j) Why do fermions have antisymmetric wave function?

1 X 10

2. Answer the following questions:

- (a) Explain the tunneling effect in quantum mechanics.
- (b) Discuss the conditions of absorption forbidden transitions.
- (c) What do you mean by screened coulomb potential?
- (d) Define the 3rd types of collision.
- (e) What is meant by J3 matrices?

2 X 5

Section-B

Answer all questions:

Unit-I

3. Explain the variation method and evaluate the energy values of ground state of He atom using variation method. 15

Or

Describe W.K.B. approximation method and derive the connection formulae. Apply this method to obtain the quantization connection for a bound state. 15

Unit-II

4. Discuss time dependent perturbation theory and hence deduce an expression for harmonic perturbation. 15

Or

- (a) Explain Femi's Golden rule in time dependent perturbation theory. 8
- (b) Explain transition probability for absorption and induced emission in the dependent perturbation theory. 7

Unit-III

5. Deduce an expression for the scattering cross-section of particles by a spherically symmetric potential. Explain the significance of phase shift. 11+4

Or

Obtain an expression for partial wave analysis and show that partial wave cross-section is four times of its geometrical cross-section. 15

Unit-IV

6. How do you interpret identical particles? Define symmetric and anti symmetric wave function. Construct these from two particle function. 15

Or

Derive Klein-Gorden equation. Discuss the difficulties association with the interaction of this equation and how they have been overcome? 15