B.Sc. DEGREE EXAMINATION,APRIL 2020
III Year VI Semester
Relativity and Quantum Mechanics

Time : 3 Hours **Max.marks :60**

Section A $(10 \times 1 = 10)$ Marks

Answer any **TEN** questions

1. What is length contraction?
2. What is called Minkowsky's four dimensional space–time continuum?
3. Differentiate between phase velocity and group velocity.
4. Calculate the de-Broglie wavelength of neutron of energy 28.8 eV. Given h = 6.62x10 $^{-34}$ Js, m=1.67x10 $^{-27}$ kg.
5. What are the adjoint operators?
6. What is expectation value?
7. Write the properties of wave function.
8. What do you mean by barrier penetration?
9. What is meant by scattering amplitude?
10. Define reduced mass.
11. What is time dilation?
12. What do you understand by the term "eigen value" and "eigen function"?

Section B $(5 \times 4 = 20)$ Marks

Answer any **FIVE** questions

13. Derive the relativistic formula for the variation of mass with velocity.
14. What are matter waves? Obtain an expression for its wavelength.
15. What are the linear operators? Describe two linear operators of fundamental importance.
16. Obtain an expression for the energy of a particle in a one dimensional box.
17. Explain how total scattering cross – section can be obtained from differential cross – section.
18. Explain uncertainty principle and it's consequences.
19. Discuss the transformation from centre of mass to laboratory frame.

Section C $(3 \times 10 = 30)$ Marks

Answer any **THREE** questions

20. State the postulates of special theory of relativity. Derive Lorentz transformation equations.
21. Describe Davisson and Germer experiment for the study of electron diffraction.
22. Derive Schrodinger time dependent wave equation.
23. Formulate Schrodinger's equation for a rigid rotator. Find its eigan values and eigen functions.
24. Define scattering amplitude. Derive the equation for the differential scattering cross-section.

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