

2020

Time : 3 hours

Full Marks : 100

Pass Marks : 45

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Answer five questions, selecting at least two questions from each Group, in which Q. No. 1 is compulsory.

1. Answer any four questions of the following : 5×4 = 20
- (a) What do you mean by holonomic and non-holonomic constraints ?
 - (b) Explain Inertial and Non-Inertial frame of references.

- (c) State and explain D'Alembert's principle.
- (d) Write down the Probability theorems of Statistical thermodynamics.
- (e) What do you mean by wave particle duality ?
- (f) What is principle of virtual work ? Explain.

Group – A

- 2. Deduce Schrodinger's time independent and time dependent equations for matter wave. Explain the physical significance of wave function ψ . 20
- 3. Explain Coriolis and centrifugal forces. Mention their simple applications and obtain an explicit expression for each of them. 20
- 4. Explain Hamilton's principle and use it to deduce Hamilton's equation for a holonomic conservative system. 20
- 5. What do you mean by Group and Phase velocities ? Establish relation between them. 20

Group – B

6. What are the fundamental assumptions of statistical mechanics ? State and prove Boltzmann's theorem connecting entropy and probability. 20
7. Show the essential requirements of Fermi Dirac Statistics. Considering the free electron in a metal to form a Fermi gas, deduce an expression for energy distribution function for the electron gas. 20
8. Give an account of B. E distribution law and discuss its application to liquid Helium II. 20
9. State and prove Stefan-Boltzmann law. Describe how the law can be verified experimentally. 20

