

APRIL/MAY 2018

HMPH12 — ADVANCED PHYSICS I

Time : Three hours

Maximum : 75 marks

SECTION A — ($5 \times 6 = 30$ marks)

Answer ALL questions.

All questions carry equal marks.

1. (a) How would you use Schrödinger field formalism to a system of bosons? Explain.

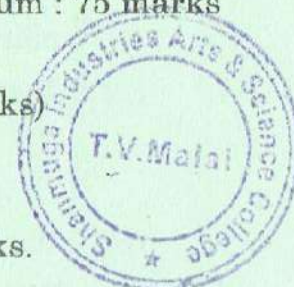
Or

- (b) What are creation and annihilation operators? Explain.

2. (a) What are quarks? Explain the types and properties of quarks.

Or

- (b) Discuss the theory of formation and disintegration of compound nucleus.



3. (a) Describe the different types of conformational analysis in five membered ring.

Or

- (b) What are static and dynamical systems? Explain the different types of equilibrium points of a dynamical system.
4. (a) Discuss the characteristics of super ionic solids.

Or

- (b) Write a note on PN junction of solar cells.
5. (a) Write a short note on interaction between polar solutes and non-polar solvents in solution.

Or

- (b) Explain the theory of dielectric relaxation and loss.

SECTION B — ($3 \times 15 = 45$ marks)

Answer any THREE questions.

All questions carry equal marks.

6. What do you understand about the second quantization of Dirac field? Explain in detail. Discuss the anti-commutation relations for the Dirac field.
7. State and explain CPT invariance. Deduce the Cell Mann Nishijima equation.

8. What are autonomous and non-autonomous systems? Discuss the free and forced oscillations of a non-linear oscillator.

9. Describe the classification of super-ionic conductors based on the mobile ions and microstructure. State the applications of super-ionic conducting materials with suitable examples.

10. (a) Derive the Cole-Cole equation.
- (b) Write a short note on Cole-Davidson plots.