A-0599

Total Pages : 3 **Roll No. .....**

MSCPH–558

M.Sc. PHYSICS (MSCPH)

(Particle Physics)

4th Semester Examination, Session December 2024

Time : 2:00 Hrs. Max. Marks : 70

Note* :–** This paper is of Seventy (70) marks divided into Two (02) Sections 'A' and 'B'. Attempt the questions contained in these Sections according to the detailed instructions given therein. ***Candidates should limit their answers to the questions on the given answer sheet. No additional (B) answer sheet will be issued.

Section–A

Long Answer Type Questions 2×19=38

***Note* :–** Section 'A' contains Five (05) Long-answer type questions of Nineteen (19) marks each. Learners are required to answer any *two* (02) questions only.

1. Discuss the fundamental interactions in nature and their significance in the study of elementary particles.

2. What is CP violation ? Explain its significance in mesons and describe how it affects symmetry principles in particle physics.

3. Explain the historical development of the study of elementary particles and their classification.

4. Compare and contrast the kronecker product of two and three representations using Young Tableaux, providing examples from baryon multiplets.

5. Explain the construction and working principles of cloud chambers and bubble chambers as particle detectors. Describe their historical significance in the discovery of fundamental particles.

Section–B

Short Answer Type Questions 4×8=32

***Note* :–** Section 'B' contains Eight (08) Short-answer type questions of Eight (08) marks each. Learners are required to answer any *four* (04) questions only.

1. Define lepton number and baryon number. Give examples of particles associated with these quantum numbers.

2. Describe parity violation and its significance in weak interactions.

3. Discuss the concept of symmetry and conservation laws in elementary particle physics providing examples of conserved quantities.

4. Discuss the diagonal generators, weights, and shift operators in SU(3) symmetry.

5. Construct and interpret the complete weight diagram for the (1, 0) representation of SU(3).

6. Compare the Geiger-Muller counter and ionization chamber based on their operating principles and applications.

7. What is a nuclear emulsion technique, and where is it used ?

8. What is the fundamental representation of SU(2), and how is its weight diagram constructed ?

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