A–097

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

MSCPH-558

M.Sc. PHYSICS (MSCPH)

(Particle Physics)

4th Semester Examination, 2024 (June)

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 quantum numbers associated with elementary particles. Give corresponding conservation laws. Give at least one example in support of each conservation.

2. What are quarks ? Give the elementary theory of structure of a few hadrons based on quark model.

3. Deduce Gell-Mann Okubo mass formula. How far do the baryon and meson masses agree with their masses predicted by this formula ?

4. What will be the Young tableaux diagram for SU(5) and its conjugate, i.e., 5 and 5. Find the dimension of SU(5) and the number of diagonal matrices.

5. Describe the principle and working of an ionization chamber and compare it with a semiconductor detector. Explain its working.

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. Which of the following reactions can occur ? State the conservation laws violated :

   (a) $\Lambda^0 \rightarrow p^+ + \pi^-$

(b) $p + p \rightarrow p + n + \pi^+$

(c) $p + \pi^- \rightarrow \pi^0 + n$

(d) $e^+ + e^+ \rightarrow \mu^+ + \pi^-$

2. Discuss in detail the strange particles.

3. What are anti particles ? Describe the properties of any such two such particles.

4. Construct quark structure of a nucleon and a pion.

5. Define fundamental representation of SU(2) group.

6. What is meant by the approximate SU(3) symmetry of strong interaction ? How is this broken ?

7. Discuss the Kronecker product of three particle state vectors in detail.

8. What is the principle and significance of a photomultiplier tube in a scintillation counter ?

****