

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.

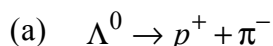
1. Discuss the quantum numbers associated with elementary particles. Give corresponding conservation laws. Give at least one example in support of each conservation.
2. What are quarks ? Give the elementary theory of structure of a few hadrons based on quark model.
3. Deduce Gell-Mann Okubo mass formula. 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 $\bar{5}$. 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 :



(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 ?
