A–1188

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MSCPH-558

M.Sc. Physics (MSCPH)

Particle Physics

Examination February, 2026

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. Elaborate the conservation laws governing elementary particles with examples.

2. What are quarks ? Explain the quark model. Also give two factors which do not support the existence of quarks

3. Define a symmetry group. Demonstrate through an example that symmetry group obeys the properties of closure, identity, inverse, and associativity.

4. Draw the Young tableaux diagrams for 8 and 6 under SU(3).

5. Discuss completely the construction, working and theory of a GM counter. Give its drawbacks.

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

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

   (c) $p + \overline{\nu}_e \rightarrow n + e^+$

   (d) $p + \pi^- \rightarrow \wedge^0 + K^0$

2. Discuss briefly iso-spin and strangeness.

3. Define parity, charge conjugation and time reversal,, State CPT theorem,

4. Describe the fundamental differences between baryons and mesons.

5. Explain weight diagram of fundamental representation of SU(2) generator.

6. What is parity violation ? Discuss briefly.

7. Explain the principle of ionization chamber.

8. Give the properties of strong and weak interactions of elementary particles.

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