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S-4240

M.Sc. (Fourth Semester) Examination, 2024-25

PHYSICS

Paper – Second

(Particle Physics)

(PHY-C-017)

Time : Two Hours] **[Maximum Marks : 60**

Note : Attempt any *four* questions. All questions carry equal marks.

1. What are elementary particles? Classify them based on their mass and spin. Define and distinguish between leptons, mesons, and baryons, including examples.

2. What are antiparticles? Discuss the concept of antiparticle with an energy band diagram. Describe the properties of any two antiparticles.

3. Define lepton number, baryon number, isospin, and hypercharge. How do these quantum numbers help classify particles and govern allowed interactions?

4. What are the conservation laws used with elementary particles. Discuss the CPT symmetry in conservation law?

5. Compare the four fundamental interactions in terms of their relative strengths, ranges, characteristic interaction times, and mediating particles. Discuss the role of the weak nuclear force in processes like beta decay.

6. Discuss briefly the concept of unification of forces. What are the three forces in the Grand Unified Theory? How do you explain the theory of everything?

7. Describe quarks as the fundamental building blocks of hadrons. List the six quark flavors, and discuss their electric charges, approximate masses, and the concept of antiquarks.

8. Explain the standard model of particle physics. How does the Higgs boson affect the Standard Model?