Roll No. .....

(05/25)

15421

M. Sc. EXAMINATION

(For Batch 2021 & Onwards)

(Third Semester)

PHYSICS

MSc/Phy/3/CC12

Nuclear and Particle Physics

Time : Three Hours *Maximum Marks : 70*

Note : The question paper will consist of nine questions in all. Q. No. **1** will be compulsory without any internal choice and consist of five short answer type questions of 2 marks each covering the whole syllabus. In addition, eight more questions are set unit-wise comprising of two questions each from four Units. Attempt *four* more questions, selecting *one* question from each Unit.

(Compulsory Question)

1. (a) Discuss basic nuclear properties Size and Shape. 2

(b) Write points of similarity between liquid drop and nucleus. 2

(c) What do you mean by Q-value of a reaction. 2

(d) Which is force most strong amongst fundamental forces ? Justify your answer. 2

(e) Write Gell-Mann-Nishijima formula. Explain, what each symbol represents in this formula. 2

Unit I

2. In case of a deuteron discuss its ground state by square well solution, comment on its magnetic dipole and electric quadrupole moments. 15

3. What are fundamental forces of nature and compare them with each other. In detail explain strong nuclear force properties. 15

Unit II

4. Discuss single particle shell model for parabolic and square well potentials. 15

5. Compare the Nuclear Shell model and Liquid drop models. What are their successes and failures ? 15

Unit III

6. Write notes on the following :

   (a) Parity non-conservation in Beta decay 5

   (b) Internal conversion 5

   (c) Selection rules for Beta decay. 5

7. What are the various types of nuclear reactions ? Give one example for each. What is Q-value equation discuss its solution ? 15

Unit IV

8. Write notes on the following :

   (a) Charge conjugation and parity operators 5

   (b) CPT Theorem 5

   (c) Conservation Laws and Symmetries. 5

9. Write notes on the following :

   (a) Classification of elementary particles 5

   (b) Quark structure of Hadrons and Quark flavours 5

   (c) Colour Quantum numbers and Gluons. 5

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