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 :   Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory.

1. Explain briefly the following :

    (i)   Magnetic dipole moment of deuteron.

    (ii)   Spin-orbit coupling of an electron bound in atom.

(iii) Internal conversion

(iv) CPI theorem

(v) Isospin multiplets. $5 \times 2 = 10$

Unit I

2. (a) Discuss charge independence of nuclear forces. 7

   (b) Discuss electric quadruple moment of deuteron. 8

3. Derive the square well potential solution for the deuteron problem. 15

Unit II

4. What is liquid drop model of the nucleous ? Derive semi-empirical mass formula. 15

5. What is spin-orbit coupling in nuclei for the shell model ? Explain single particle shell model for square well potential. 15

Unit III

6. What is Q-value of a nuclear reaction ? Discuss different types of nuclear reactions. 15

7. Write short notes on the following : $5 \times 3 = 15$

   (i) Nuclear fission

   (ii) Nuclear fusion

   (iii) β-decay selection rules.

Unit IV

8. What are Mesons ? Derive Gell-Mann-Nishijima formula. 15

9. Discuss isospin and strangeness conservation and non-conservation in different types of particle interactions. 15