

**P-108**

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# **MSCPH-511**

## **Nuclear Physics**

M.Sc. Physics (MSCPH)

3rd Semester Examination, 2023 (June)

**Time : 2 Hours]**

**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 answer to the questions on the given answer sheet. No additional (B) answer sheet will be issued.

### **SECTION–A**

#### **(Long Answer Type Questions)**

**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.

(2×19=38)

1. Discuss the exchange forces and the spin dependency of nuclear forces. Describe the meson theory of nuclear forces and obtain the solution for exchange quanta.

2. Write short notes on the following :
  - (a) Nuclear fission & fusion.
  - (b) Semiconductor detectors.
  - (c) Isospin.
3. Explain the principle of synchrotron and its working with figure.
4. Describe the fermi theory of  $\beta$  decay and discuss parity violation in weak interaction.
5. Explain  $\alpha$  (alpha) decay with suitable examples. Also discuss Geiger-Nuttal law and barrier penetration in  $\alpha$  (alpha) disintegration.

## **SECTION-B**

### **(Short Answer Type Questions)**

**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. (4×8=32)

1. Define Q value of a reaction. Derive an expression for Q value in case of two body system.
2. Discuss various types of radioactive equilibrium.

3. Describe the optical model for nucleus.
  4. Explain the relationship between depth of nuclear potential and range of Nuclear force.
  5. What do you mean by electric quadrupole moment? Derive it's formula. How it is related to the shape of nucleus ?
  6. What are the various conservation laws applicable in the nuclear reactions?
  7. Derive the Bethe-Weizsacker's Semi empirical mass formula.
  8. Explain the basic principle, construction and working of Si(Li) detector. What are it's application ?
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