[4]

SECTION 'C' $\boxed{4 \times 10 = 40}$
Long Answer questions (Word limit 400-450 words.)

Q. 1. Discuss the Meson theory of nuclear force.

OR

Discuss nucleon-nucleon scattering at low energy.

Q. 2. Discuss the Fermi theory of $\beta - decay$.

OR

Discuss the detection and properties of gamma decay.

Q. 3. Describe the shell model of nuclei with assumptions and evidence.

OR

Give the basic assumption of liquid drop model and show how you can explain the fission process on the basis of this model.

Q. 4. Applying partial wave analysis method, obtain an expression for nuclear reaction cross-section.

OR

Discuss the different symmetry, groups and conservation laws for elementary particles.

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ROLL NO....................

PHY. 403/22

IV SEMESTER EXAMINATION, 2022

M.Sc. (PHYSICS)

PAPER-III

NUCLEAR AND PARTICLE PHYSICS

TIME: 3 HOURS   **MAX.- 80**
                                                                                          MIN.- 16

Note: The question paper consists of three sections A, B & C. All questions are compulsory.
Section A- Attempt all MCQ questions
Section B- Attempt one question from each unit.
Section C- Attempt one question from each unit.

SECTION 'A' $\boxed{2 \times 8 = 16}$
Multiple Choice Questions

1. For a nuclear force, which is not true?

(a) Spin dependent   (b) Charge dependent

(c) Short range   (d) Velocity dependent

2. For bound state of the system, the scattering length is -

(a) Positive   (b) Negative

(c) Zero   (d) Neither Positive nor Negative

P.T.O.

3. Parity is not conserved in -

   (a) $\alpha - decay$ (b) $\beta - decay$

   (c) $\gamma - decay$ (d) None of these

4. $\beta - ray$ spectra is -

   (a) Discrete   (b) Continuous

   (c) Both   (d) None of the above

5. The neutrons with energies above 1.2 MeV are called -

   (a) Slow neutrons   (b) Fast neutrons

   (c) Very fast neutrons   (d) Ultra fast neutrons

6. Nuclear fission can be successfully explained by using -

   (a) Shell model   (b) Optical model

   (c) Collective model   (d) Liquid drop model

7. The baryon number (B) of neutron is -

   (a) 0   (b) 1   (c) -1   (d) -2

8. The strangeness quantum number (S) of proton is-

   (a) 0   (b) 1   (c) -1   (d) $\frac{1}{2}$

SECTION 'B' $\boxed{4 \times 6 = 24}$

Short Answer Type Questions

Q.1. Explain the ground state of deutron.

OR

Explain the exchange forces in nuclei system.

Q.2. State the selection rule for β-decay.

OR

Describe the shape of β- spectrum.

Q.3. State the basic assumptions of collective model and explain them.

OR

Describe spin-orbit interaction.

Q.4. Explain Laptons and Hadron particles.

OR

Derive the expression for Q-value in nuclear reaction.