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PG CBCS
M.SC. Semester-IV Examination, 2021
PHYSICS
PAPER: PHS 402

Full Marks: 40**Time: 2 Hours**

Write the answer for each unit in separate sheet

The figures in the right-hand margin indicate full marks.
 Candidates are required to give their answers in their own words as far as practicable

401.1: Nuclear Physics II

Marks: 20

Answer any TWO questions of the following: 10×2=20

- | | |
|---|---|
| 1. What do you understand by level width and level separation? | 3 |
| Deduce Bohr-Wheeler theory of nuclear fission. | 4 |
| Give some evidences for existence of shell model. | 3 |
| 2. Explain Nordheim's rule. | 3 |
| Write short note on electric quadrupole moment of a nucleus. | 3 |
| Explain qualitatively the collective model of Bohr and Mottelson. | 4 |
| 3. Explain the slowing down of neutrons in matter. | 6 |
| What do you mean by moderating ratio? | 2 |
| Which one is better as a moderator: hydrogen or deuterium? Explain. | 2 |
| 4. What are strange particles and why are they called so? | 2 |
| Explain the concept of isospin. | 2 |
| Write some basic features of nuclear force and explain. | 3 |
| Draw Baryon octate. | 3 |

402.2: Quantum Field Theory

Marks: 20

Answer any TWO questions of the following: 10×2=20

1. Define symmetry, state, and prove Noether's theorem.
2. If $L = \Psi (i \gamma^\mu \partial_\mu - m) \Psi$ •

(P.T.O.)

(2)

prove that Hamiltonian density $H = i \Psi^+ \Psi$

3. (i) $e^- + e^+ \longrightarrow e^- + e^+$

(ii) $\gamma + e^- \longrightarrow \gamma + e^-$

Draw the Feynman diagram for the above processes and evaluate Feynman amplitudes.

4. Calculate the cross-section per unit volume for the creation of electron-positron pairs by the e.m potential $A^\mu = (0, 0, ae^{-i\omega t}, 0)$

where ω and a are constants.
