LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – PHYSICS

FOURTH SEMESTER – APRIL 2014

PH 4811 - NUCLEAR PHYSICS

Date : 29/03/2014   Dept. No.   Max. : 100 Marks
Time : 01:00-04:00

PART A

Answer **ALL** the questions   (10 × 2 = 20)

1. What is Yukawa's field particle?

2. Give the relation between the 3 kinds of exchange operators.

3. Explain the stability of nuclei in terms of binding energy.

4. Mention any two significant details derived from atomic masses.

5. What are nuclear chain reactions?

6. Distinguish between nuclear fission and fusion reaction with one example for each.

7. What are neutron stars?

8. List the two types of β - decay process.

9. What the types of interactions occurring in elementary particles?

10. What are hadrons? Give any two examples.

PART – B

Answer any **FOUR** questions   (4 × 7.5 = 30)

11. Write brief notes on:

    (i) No excited S-states in the deuteron   (4)

    (ii) Range and depth of the nuclear potential   (3.5)

12. Derive Levy's mass formula and give a detailed description of atomic masses and their significance.

13. Explain the continuum theory of nuclear reactions.

14. With a neat diagram discuss the β-decay spectrum and account for neutrino hypothesis.

15. Describe the classification of elementary particles with a neat sketch.

PART – C

Answer any **FOUR** questions   (4 × 12.5 = 50)

16. Discuss the iso-spin formalism based on exchange forces.

17. Outline the salient features of the shell model and the significance of magic numbers.

18. Explain in detail the various components of a nuclear reactor.

19. Discuss Fermi's theory of β-decay and hence distinguish between Fermi and Gamow-Teller selection rules for various transitions.

20. State and explain the CPT theorem for elementary particles.

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