 LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

**M.Sc.** DEGREE EXAMINATION - **PHYSICS**

FOURTH SEMESTER – APRIL 2011

# PH 4808 - NUCLEAR PHYSICS

Date : 09-04-2011 Dept. No. Max. : 100 Marks

Time : 9:00 - 12:00

**PART-A**

**Answer all questions (10 x 2 = 20)**

1. Define the fissionability parameter. Estimate its value.

2. Write down the Bethe-Weizsaker mass formula and explain the various terms occurring in it.

3. Name the 3 types of exchange forces and also the single force which does not possess the exchange character.

4. Name the various types of central potential available to solve the deuteron problem in nuclear physics.

5. Identify the type of transition either Fermi or Gamow-Teller or both in the following reaction.

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6. On the basis of nuclear shell model, determine the spin and parity of B11 after writing down the nucleon configuration.

7. Write down the Geiger Nuttal law and explain the various terms in it.

8. What is Gamow factor in alpha decay? What does it depend on?

9. Give the Gell-Mann-Nishijima formula. Explain the various quantities in the formula.

10. What are strange particles? Give examples.

**PART B**

**Answer any four questions (4x7.5=30)**

11. Write a note on the meson theory of nuclear forces.

12. What are the important features of the Levy’s mass formula?

13. Outline the Optical model of nuclear reactions.

14. How are neutron stars formed?

15. Explain the meson octet structure of elementary particles.

**PART C**

**Answer any four questions (4x12.5=50)**

16. How are the experimental observations of the deuteron explained using the quantum mechanical theory?

17. Derive the semi-empirical mass formula of Weizacker.

18. Derive the Breit-Wigner single level formula for resonance scattering.

19. Describe the important features of the Fermi’s theory of beta decay.

20. (a) The baryon decuplet predicts the Ω- hyperon. What are its quantum numbers? (6)

(b) Discuss the possible decay modes of Ω- allowed by the conservation laws and show that the weak decay is the only possibility. (6.5)

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