 LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FOURTH SEMESTER – APRIL 2012

# PH 4808/4804 - NUCLEAR PHYSICS

Date : 20-04-2012 Dept. No. Max. : 100 Marks

Time : 1:00 - 4:00

**PART - A**

Answer **ALL** questions: (10x2=20)

1. Calculate the mass number of the nucleus whose radius is 4.4fm.

2. 2He4 nucleus has no magnetic moment. Why?

3. Define and explain Majorana operator.

4. What do you understand by parity violation in β decay?

5. How are thermal neutrons produced?

6. What is a compound nucleus? Give an example:

7. Define β+, β- and orbital electron capture?

8. Write the shell configuration and predict the spin and parity of 13Al27 nuclei on the basis of single particle shell model.

9. What is level width of resonance ?How is it connected with life time of the nucleus?

10. Give the modes of decay of muons.

**PART - B**

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

11. Explain how the study of electric quadrupole moment of the nucleus gives information about the shape of the nucleus.

12. Give a brief account on meson theory of nuclear forces.

13. Explain the compound nucleus theory of nuclear reaction.

14. Write a short note on neutron stars.

15. Classify elementary particles.

**PART - C**

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

16. Discuss the theory of n-p scattering at low energies and hence find an expression for the scattering cross section for l=0.

17. a) Give a detailed account of nuclear shell model. Also discuss the merits and drawbacks of the above model.

b) Find the total angular momentum and parity for the ground state of 16S33 nucleus from the shell model .Also find the electric quadrupole moment from collective model.

18. Explain Gamow’s theory of alpha decay. Derive Geiger -Nuttal law.

19. Explain briefly resonance states of compound nucleus and obtain Breit -wigner formula for l=0 state.

20. a) What are Quarks? Give the quark model of i)mesons ii)Protons and antiprotons.

b) Write a short note on the weak and strong nuclear forces.

\*\*\*\*\*\*\*\*\*\*