

Code No. 6968 / CBCS / Non-CBCS

**FACULTY OF SCIENCE****M. Sc. IV – Semester (CBCS/Non-CBCS) Examination, May / June 2017****Subject : Physics****Paper – I : Nuclear Physics****Time : 3 Hours****Max. Marks: 80****Note : Answer all questions from Part–A and Part–B. Each question carries 4 marks in Part–A and 12 marks in Part – B.****PART – A (8 x 4 = 32 Marks)  
(Short Answer Type)**

- 1 Write assumption of liquid drop model.
- 2 What do you mean by quadrupole moment?
- 3 What do you mean by  $\alpha$ -decay?
- 4 Why an  $\alpha$ -particle radioactive emitter emits  $\alpha$ -particles and not the protons directly?
- 5 High atomic number materials are generally preferred to shield gamma sources. Why? Explain.
- 6 What is meant by pair production and annihilation events?
- 7 Give a reasonable classifications of nuclear reaction?
- 8 What are direct reactions?

**PART – B (4 x 12 = 48 Marks)  
(Essay Answer Type)**

- 9 (a) Draw an energy level diagram for nuclear energy states on the basis of shell model of nucleus and hence explain the significance of magic numbers.  
OR  
(b) Discuss semi-empirical mass formula explaining meaning of each term in it and state its limitations.
- 10 (a) Explain how  $\alpha$ -particles with energies less than the height of the potential barrier are emitted from a radioactive nucleus.  
OR  
(b) Explain about selection rules for allowed and forbidden transitions of  $\beta$ -decay.
- 11 (a) Show that the stopping power does not depend on the mass of the particle but is only a function of its velocity and charge.  
OR  
(b) Describe the principle and working of a scintillation detector for the detection of gamma rays.
- 12 (a) Give an account of the kinematics of nuclear reactions. With is Q-value and how are they calculated?  
OR  
(b) Write an essay on elementary particles and discuss about quarks.

\*\*\*\*\*