

**FACULTY OF SCIENCE**

**M.Sc. IV-Semester (New)(CBCS/Non-CBCS) Examination, April / May 2014**

**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 Explain the prediction of shell model of nuclei.
- 2 What do you mean by nuclear forces?
- 3 Explain the selection rules of gamma decay.
- 4 The particles coming from electron gun and  $\beta$ -active radioactive substance both are electrons. What is the difference between them?
- 5 Explain about photo electric effect.
- 6 Explain about pair production.
- 7 What do you mean by nuclear fission?
- 8 Explain about Quark model.

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

- 9 (a) Discuss the theory of ground state of deuteron and explain, why the excited states of deuterons do not exist.  
**OR**  
(b) Write the assumptions of liquid drop model and explain the semi-empirical mass formulation.
- 10 (a) Discuss Fermi's theory of beta decay and explain about Fermi-Kurie plot.  
**OR**  
(b) Describe Gamow's theory of  $\alpha$ -decay. What do you mean by fine structure of  $\alpha$ -spectrum?
- 11 (a) Compare and contrast gaseous and solid state detectors for nuclear radiations with regard to the principle of detection, efficiency and range of application.  
**OR**  
(b) Show that the stopping power of charged nuclear particles does not depend on the mass of the particle but is only a function of its velocity and charge.
- 12 (a) Give the classification of elementary particles and explain about their quantum numbers.  
**OR**  
(b) Write the basic theory of direct reactions and explain Born approximation.

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