

Roll No. ....

**74603**

**M. Sc. Physics 2nd Semester  
Examination – May, 2016**

**NUCLEAR AND PARTICLE PHYSICS**

**Paper : VII**

*Time : Three Hours ]*

*[ Maximum Marks : 80*

*Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.*

**Note :** Attempt *five* questions in all, selecting *one* question from each Unit. Question No. 1 is *compulsory*. All questions carry equal marks.

1. (a) What do you understand by spin dependance of nuclear forces ? 4
- (b) Why is the spin of odd-A nuclei always multiple of half integer ? 4
- (c) Define Nuclear reaction cross-section. In what unit is measured ? 4

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- (d) Explain strangeness and hypercharge for elementary particles. 4

### UNIT – I

2. (a) Explain the relationship between depth of nuclear potential and range of nuclear force. 8
- (b) Explain the concept of isospin formalism. Why neutrons and protons we called nucleons. 8
3. (a) Discuss the low energy n-p scattering in terms of effective range theory. 8
- (b) What are tensor forces in nuclei ? What is the origin of these forces ? 8

### UNIT – II

4. Write down the various evidences in favour of nuclear shell model. Explain how this model was able to explain the sequence of levels experimentally observed ? 16
5. (a) What is the concept of fission to explain stability of nuclei? 8
- (b) What are the various features of Schmidt lines? 8

### UNIT – III

6. (a) Describe electromagnetic decays and various selection rules applicable for these decays. 8
- (b) Describe parity non-conservation in  $\beta$ -decay. 8
7. (a) What are the various conservation laws applicable in nuclear reactions ? 8
- (b) Describe Optical Model for nucleus. 8

### UNIT – IV

8. (a) Describe *four* basic interactions in nature. 8
- (b) What is the role of symmetries ? Explain SU(2) and SU(3) symmetries. 8
9. (a) Describe charge conjugation, parity conservation and time reversal. State and explain CPT theorem. 8
- (b) Explain Quark model for elementary particles. 8