(b) Through the use of input and ouput files in Fortran write a general syntax to read and write an array of ten items. **10**

8. (a) Write a Fortran program to read and write a matrix of 3 × 3 order. **5**

(b) Evaluate the following integral by using Simpson's 1/3rd rule :

$$\int_0^2 \frac{1}{1+y^2}\,dy.$$

Here take $h = 1/2$. **10**

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Ph.D. Course Work EXAMINATION, May 2019

(PHY.)

PHY902B

Nuclear Physics

Time : 3 *Hours*] [*Maximum Marks :* 75

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

Note : The candidates should attempt *five* questions selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. (a) Why a specific set of numbers in nuclear physics termed as magic numbers ? Explain. **7**

(b) Predict the ground state spin parity of the following using extreme single particle model :

^{11}Be, ^{15}C, ^{19}C and ^{23}O. **8**

2. Show that, why the spin-orbit coupling is required to reproduce magic numbers ? Also depict the energy levels of shell model up to nucleon number equal to fifty. **15**

Unit II

3. Establish the Rutherford's formula for differential cross-section for Coulomb scattering when quantum and relativistics effects has been entertained properly. **15**

4. (a) What are partial waves gives their significance ? **5**

(b) Draw the schematic picture showing the form of the wave function of a particle wave in scattering experiment. **3**

(c) Discuss and write the expression for incident and scattered waves in collisions. **7**

Unit III

5. Write in detail in-flight fragment separation experimental method. **15**

6. (a) How radioactive ion beams (RIBs) are being generated. **5**

(b) Write a note on neutron skins. **5**

(c) Explain the term 'nucleon halos.' In which properties the halo nuclei are different to non-halo nuclei ? **5**

Unit IV

7. (a) Write and discuss the character set used in Fortran. **5**