Roll No.......................

Total No. of Units   : 04
Total No. of Printed Pages : 03

Code No. : 03/201

Third Semester Examination, Dec. 2018

M.Sc. PHYSICS

Paper - II

NUCLEAR AND PARTICLE PHYSICS

Time : 3 Hrs.   **Max. Marks : 80**

- Part A and B of each question in each unit consist of very short answer type questions which are to be answered in one or two sentences.
  Part C (Short answer type) of each question will be answered in 200-250 words.
  Part D (Long answer type) of each question should be answered within the word limit 400-450.

$$_2^4He + _7^{14}N \rightarrow _1^1H + _8^{17}O + _0^0n$$

Unit - I

Q.1 A. What is the relationship between half life time   and decay constant

' '? **(2)**

Q.1 B. Whether the following nuclear reaction is possible or not justify : **(2)**

Q.1 C. Show the reaction of   for proton by transmutation. **(4)**

OR

Define compound nuclear reaction mechanism.

P.T.O.

Q.1 D. Explain nucleon-nucleon interaction.   **(12)**

OR

Explain the meaning of differential and total scattering cross-sections. Obtain an expression for the total cross-section in *n-p* scattering at low energies.

Unit - II

Q.2 A. Define magic number.   **(2)**

Q.2 B. How much energy is released by the diffusion of two deuteron nuclei?   **(2)**

Q.2 C. Explain the spin-orbit coupling.   **(4)**

OR

Find the ground state angular momentum of

a)   b)

Q.2 D. Discuss the limitation and failures of a single particle shell model. **(12)**

OR

Explain in brief collective model of Bohr and Mottelson.

Unit - III

Q.3 A. What is a secular equilibrium state?   **(2)**

Q.3 B. What is the value of 'Q' for exothermic and endothermic reactions?   **(2)**

Q.3 C. Explain in brief the Dirac's theory of pair production.   **(4)**

OR

Define nuclear resonance absorption.

Q.3 D. Describe internal conversion and nuclear isomerism.   **(12)**

OR

Discuss briefly the methods for measuring the energies of   -rays.

Unit - IV

Q.4 A. In which reactions pions are produced?   **(2)**

Q.4 B. What are the different kinds of Leptons?   **(2)**
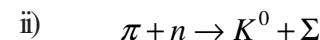
Q.4 C. Define C-P-T theorem.   **(4)**

OR

Indicate whether the following reactions are examples of associate production. Justify your answers.

i)

ii) $\pi + n \to K^0 + \Sigma$

iii)

iv)

Q.4 D. What are the facts that lead to the proposal of strangeness quantum number?   **(12)**

OR

Explain Iso-spin multiples, strangeness and associated production.

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