Roll No. .....

42021

M. Sc. (Physics) 4th Semester Examination – May, 2019

NUCLEAR & PARTICLE PHYSICS

Paper : PHY(H)-401/4247

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 : All questions carry equal marks. Question **1** is ***compulsory*** and attempt ***one*** question from each unit.

1. (i) Write a short note on Wigner, Majorna, Bartlett, and Heisenberg Potential. 4 × 4 = 16

(ii) Using Single particle shell model predict the ground state spin, parity, and magnetic moment of :

(a) ${}^{17}_{8}O$ (b) ${}^{47}_{22}Ti$

(iii) What are expected types of multipole / gamma ray transitions between following states of odd A nuclei (a) $f_{5/2}$ to $d_{3/2}$ and (b) $h_{9/2}$ to $s_{1/2}$.

(iv) Are the following interactions allowed ? If allowed then write the type of interactions.

(a) $\pi^- + p \rightarrow A^0 + K^0$

(b) $p + p \rightarrow p + \pi^+ + K^0 + A^0$

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UNIT – I

2. Discuss experimentally measured physical properties the ground state of deuteron and compare its binding energy obtained by considering square well potential of this two nucleon system. 16

3. Prove that scattering cross-section for low energy nucleon-nucleon scattering is independent of nuclear potential. 16

UNIT – II

4. Write the assumptions and merits of liquid drop model. Explain nuclear fission on the basis of liquid drop model. 16

5. What are magic numbers ? Write the experimental evidences for magic numbers. Write assumptions of the single particle shell model and ordering of energy states according to shell model. 16

UNIT – III

6. Prove the existence of neutrino in β-decay and describe the Fermi theory of β-decay. 16

7. If the outgoing part of a partial spherical wave with angular momentum l is changed by η_l and $\eta_l = -1$, then prove that scattering cross-section attains its maximum value. 16

UNIT – IV

8. (a) Explain the elementary ideas of CP and invariance.

   (b) Explain the types of interactions occurri particle physics with examples.

9. (a) Describe Quark Model and write baryons mesons in terms of quarks.

   (b) Write a short note on SU(2) and SU symmetries.
