PG Even Semester (CBCS) Exam., May—2018

PHYSICS

(4th Semester)

Course No. : PHYCC–402

(Nuclear and Particle Physics)

Full Marks : 70
Pass Marks : 28

Time : 3 hours

The figures in the margin indicate full marks for the questions

Answer **five** questions, taking **one** from each Unit

UNIT—I

1. *(a)* Discuss charge independence of nuclear force and describe the isotopic spin formalism. 2+5=7

(b) Establish that nuclear force is spin dependent. 5

(c) Nuclear force is of short range or long range? How do you infer? 2

2. Study the ground state of deuteron assuming it to be in l 0 state and obtain a relation between the range and depth of the potential. Discuss about the excited states of deuteron. 10+4=14

UNIT—II

3. What are the motivations for the liquid-drop model of the nucleus? Obtain the Bethe-Weizsaecker semiempirical mass formula explaining various terms in it. 4+10=14

4. What are magic numbers? Discuss the single particle shell model to explain the magic numbers. 2+12=14

UNIT—III

5. *(a)* Discuss Fermi's theory of -decay. 9

(b) Describe Wu's experiment to establish parity violation in -decay. 5

6. Write short notes on the following : 7×2=14

(a) 2-component theory of neutrinos

(b) Solar neutrino problem

UNIT—IV

7. Explain CPT invariance. Discuss asymptotic freedom of quarks with colour confinement. What are the quark constituents of the following particles? 5+5+4=14

, ^{0}, ^{0} and

8. Write briefly the production of muons and their properties. How does muon decay happen? Show the violation of quantum numbers in weak interaction. 5+5+4=14

UNIT—V

9. Describe the construction and working of proton synchrotron. 14

10. Write short notes on the following : 8+6=14

(a) Germanium solid state radiation detector

(b) Multichannel analyser

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