M.Sc. DEGREE EXAMINATION,APRIL 2020
II Year III Semester
Nuclear Physics and Particle Physics

Time : 3 Hours **Max.marks :75**

Section A $(10 \times 2 = 20)$ Marks

Answer any **TEN** questions

1. What are tensor forces?
2. Why the nuclear forces are charge independent?
3. What do you mean by nuclear reaction cross section?
4. Give the difference between a compound nucleus and direct nuclear reaction.
5. What are inadequacies of liquid drop model of nucleus?
6. What are Schmidt lines?
7. What is neutrino hypothesis?
8. What is internal conversion?
9. What do you understand by CPT invariance?
10. Define charm quark.
11. Write a note on isospin.
12. What are Leptons?

Section B $(5 \times 5 = 25)$ Marks

Answer any **FIVE** questions

13. Give a brief account of meson theory of nuclear forces.
14. Discuss the conservation laws of nuclear reaction.
15. Explain the Bohr-Wheeler theory of nuclear fission.
16. Discuss the main features of collective model of the nucleus.
17. Discuss the various types of interactions between elementary particles.
18. Explain nuclear isomerism.
19. Calculate the Q value for the reaction ${}_7N^{14} +_2 He^4 \rightarrow_8 O^{17} +_1 H^1 + Q$
    The atomic masses of the particles are :
    ${}_7N^{14}$ =14.003074 amu, ${}_2He^4$=4.002604 amu, ${}_8O^{17}$=16.99913 amu and ${}_1H^1$=1.007825 amu

Section C $(3 \times 10 = 30)$ Marks

Answer any **THREE** questions

20. Give an outline of effective range theory of n-p scattering at low energies and show that the scattering cross section besides being the function of energy, depends upon the scattering length and effective range.
21. Derive Breit and Wigner single level formula for scattering and absorption cross-section in the vicinity of a resonance observed in neutron reaction.
22. Give a brief account of shell model of nucleus which predicts the magic numbers.
23. Discuss Fermi theory of β-decay and explain the continuous beta spectrum.
24. Discuss SU(2) and SU(3) multiplets. Write a note on Gell Mann-Okuba mass formula.

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