SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN (AUTONOMOUS)
(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)
Chromepet, Chennai — 600 044.
M.Sc. - END SEMESTER EXAMINATIONS NOVEMBER - 2022
SEMESTER - III
20PPHCT3009 - Nuclear and Particle Physics

Total Duration : 2 Hrs 30 Mins. **Total Marks : 60**

Section A

Answer any **SIX** questions $(6 \times 5 = 30$ Marks)

1. Give a brief account on nucleon- nucleon scattering
2. From the meason theory of nuclear forces if a nucleon emits a virtual pion of rest mass 270 m_e, calculate the range of nuclear forces.
3. Describe the compound nucleus theory of nuclear reactions.
4. Find the threshold energy for reaction, $N_7^{14} + n_0^1 \rightarrow B_5^{11} + He_2^4 + Q$
   Given masses N_7^{14}= 14.003074 amu, n_0^1 = 1.008665 amu, B_5^{11} =11.009305 amu, He_2^4 + Q=4.002603 amu.
5. Describe liquid drop model of the nucleus. Point out its usefulness and limitations in understanding the nuclear phenomena.
6. Discuss the selection rules for allowed and forbidden transitions in β decay.
7. Explain SU3 symmetry using Okuba mass formula.
8. Give an account of quark model.

Section B

Part A

Answer any **TWO** questions $(2 \times 10 = 20$ Marks)

9. Discuss Yukawa potential.
10. Discuss Bohr and Wheelers theory of nuclear fission and obtain the limit of nuclear stability.
11. Explain in detail about the Fermi's theory of beta decay.
12. Give a brief and logical description of all types of interactions among elementary particles.

Part B

Compulsory question $(1 \times 10 = 10$ Marks)

13. Explain resonance scattering and derive Breit Wigner formula for nuclear reactions.

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