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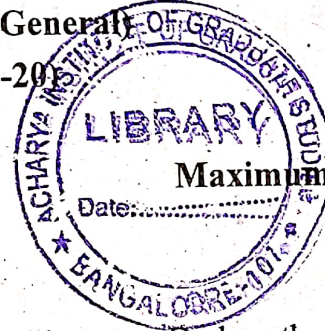
III Semester M.Sc. Degree Examination, April/May - 2022

PHYSICS

Nuclear and Particle Physics (General)

(CBCS New Scheme 2019-20)

Paper -303



Maximum Marks : 70

(3×15=45)

Time : 3 Hours

Instructions : Answer all the questions

1. a) Explain the interaction of heavy charged particle with matter. Deduce the Bethe-Bloch formula for passage of heavy charged particle through matter. (10+5=15)
- b) Discuss the mechanism of energy loss of fast electrons in matter. (10+5=15)

(OR)

2. a) Define Q-value of nuclear reaction. On the basis of Q-value, classify the nuclear reactions. (5+10=15)
- b) State Bohr's independence hypothesis. Explain the experimental verification of Bohr's independence hypothesis. (5+10=15)
3. a) Explain gamma ray spectrometry system with necessary diagram.
- b) Define energy resolution of gamma ray spectrometer. Find the energy resolution of gamma ray spectrometer for 662keV gamma ray with FWHM 40 keV. (10+5=15)

(OR)

4. a) Write Weizsacker's semiempirical mass formula and clearly explain all the terms involved in it. (8+7=15)
- b) Explain the method of finding magnetic moment of odd-A nuclei on the basis of shell model of nucleus. (8+7=15)
5. a) How do you distinguish neutrino and anti-neutrino? Describe Cowan and Reines experiment for detection of neutrino. (9+6=15)
- b) Explain the concept of isospin. Discuss the conservation of isospin, I and isospin component, I_3 in elementary particle interactions. (9+6=15)

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(OR)

6. a) What are strange particles ? Explain the Conservation of strangeness in elementary particle interactions with examples.
- b) Describe eight fold way classification of baryons.
- c) Find the strangeness of Ω^- hyperon using Gellmann-Nishijima formula.

(6+6+3=15)

7. Answer any Five of the following.

(5×5=25)

- a) Distinguish between direct and compound nuclear reactions.
- b) Find the thickness of lead shield required to reduce the intensity of 600 ke V gamma radiation by factor of 1000 ? Given mass attenuation coefficient μ_p of lead is 0.12 gm/cm².
- c) Write a note on position sensitive detector.
- d) Find the spin and parity of ${}_{12}^{25}\text{Mg}$ and ${}_{22}^{47}\text{Tinuclides}$ on the basis of shell model of the nucleus.
- e) Explain the parity violation in weak interaction.
- f) Give the quark combination of p, π^0, K^- and Σ^+ particles.

