

M.Sc. (Phy) Semester - 3 (CBCS) Examination**DEC/JAN. - 2020****Nuclear and Particle Physics (Core)****Time: 1:30 Hours****Marks: 42****Instructions:**

1. Figure to the right indicate marks.
 2. There are five questions in the question paper.
 3. Answer any three of the following questions.
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Q – 1: Answer the following questions**14**

- (a) Make a list of basic nuclear properties. Discuss time dependent nuclear properties in detail.
- (b) Define the separation energy of a nuclear particle. Prove that
$$S_{\alpha} = B_{\text{tot}}(Z, A) - B_{\text{tot}}(Z-2, A-4) - B_{\text{tot}}(2, 4)$$

Q – 2: Answer the following questions**14**

- (a) Derive the semi-empirical mass formula and discuss each term in detail.
- (b) Discuss the spin orbit coupling model in detail. Find the nuclear spin and parity for the ^{15}N , ^{15}O , ^{13}C and ^{27}Si nuclides

Q – 3: Answer the following questions**14**

- (a) Discuss Fermi's theory of beta decay
- (b) Write a short note on Neutrino Hypothesis

Q – 4: Answer the following questions**14**

- (a) Discuss the Compton Effect in detail when gamma radiations interact with matter.
- (b) Discuss in detail: Nuclear cross section.

Q – 5: Answer the following questions**14**

- (a) Discuss a nuclear reaction in lab system with necessary figure and derive nuclear reaction Q equation. Mention its special case.
- (b) Discuss the interaction of charged particle with matter and derive an equation of total energy loss per unit path.
