

B. TECH.
(SEM-IV) THEORY EXAMINATION 2017-18
NUCLEAR SCIENCE

*Time: 3 Hours**Total Marks: 70***Note:** 1. Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief. 2 x 7 = 14**

- a. What do you understand by binding energy?
- b. What is mass defect?
- c. How can you define Nuclear fusion?
- d. On what factors the chain reaction depends?
- e. What is decay constant?
- f. Discuss merits of DM counter.
- g. What are the limitations of cyclotron?

SECTION B**2. Attempt any three of the following: 7 x 3 = 21**

- a. State the properties of Nuclear forces. Describe briefly Yukawa theory of Nuclear forces.
- b. State the main assumptions of the nuclear shell model. Explain the experimental evidences which suggest this model.
- c. What do you understand by nuclear reaction? Discuss different types of nuclear reactions with examples.
- d. What are the basic components of a mass spectrograph? Describe the working principle of Aston's mass spectrograph.
- e. Describe the nature properties and uses of alpha, beta and gamma radiations.

SECTION C**3. Attempt any one part of the following: 7 x 1 = 7**

- (a) What do you mean by mass defect? How it is related with the packing factor? A neutron breaks into a proton and an electron. Calculate the energy produced in this reaction in MeV.
- (b) Write short notes on:
 - (i) Nuclear Angular Momentum
 - (ii) Nuclear Magnetic dipole moment.

4. Attempt any one part of the following: 7 x 1 = 7

- (a) Describe shell model and collective model in detail.
- (b) Explain Van De Graff Generator.

5. Attempt any one part of the following: 7 x 1 = 7

- (a) Describe the construction and working of a nuclear reactor.
- (b) Explain nuclear fission process by giving examples of U^{235} . Energy released in fission of uranium atom is 300 MeV. Calculate the amount of energy released

by 100 gm of U^{235} .

6. Attempt any *one* part of the following: 7 x 1 = 7

- (a) Explain transmission probability of incident α -particle.
- (b) Explain neutrino hypothesis regarding β -decay.

7. Attempt any *one* part of the following: 7 x 1 = 7

- (a) What do you mean by radioactive tracers? Explain their uses in material science and agriculture.
- (b) Describe the working of a cloud chamber with necessary theory and diagram.