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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.