Printed Pages: 02 **Sub Code: EOE046 / NOE046**

Paper Id: | 1 | 9 | 9 | 4 | 1 | 6 | **Roll No.** | | | | | | | | | | |

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

Time: 3 Hours ***Total Marks: 100***

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x 10 = 20

a. What do you mean by mass defect?
b. Define Nuclear Radius.
c. Write assumptions of liquid drop model.
d. Explain the conservation laws followed by nuclear reactions.
e. What do you mean by exoergic and endoergic reaction?
f. Define half-life period, mean life and decay constant.
g. What do you mean by prompt and delayed neutrons?
h. Give the assumptions of Gamow's theory of α-decay.
i. What is a mass spectrograph? What are the essentials?
j. List out the advantages of the bubble chamber.

SECTION B

2. Attempt any *three* of the following: 10 x 3 = 30

a. What is nuclear fission? How is it explained on the basis of liquid drop model?
b. What is meant by nuclear magnetic dipole moment? How is the nuclear magnetic moment determined experimentally?
c. Discuss Gamow's theory of α-decay. How far does this explain the Geiger-Nuttall law?
d. Discuss the working principle of a cyclotron and explain with the help of a neat diagram.
e. Describe the difference between ionization chamber, proportional counter and Geiger-Muller counter.

SECTION C

3. Attempt any *one* part of the following: 10 x 1 = 10

(a) Describe Hofstadter method for measuring the nuclear radius.
(b) Draw a curve showing the variation of binding energy per nucleon against the mass number. Use the curve to explain the instability of light and heavy nuclei while stability of intermediate nuclei.

4. Attempt any *one* part of the following: 10 x 1 = 10

(a) Discuss semi-empirical mass formula explaining meaning of each term in it and state its limitations.
(b) Explain Q-value of a reaction. How is it related to threshold energy of a particle?

5. Attempt any *one* part of the following: 10 x 1 = 10

(a) Discuss interactions of γ-rays with matter.

(b) Describe the salient features of Fermi theory of β-decay. What do you understand by allowed and forbidden transitions?

6. Attempt any *one* part of the following: 10 x 1 = 10

(a) What do you understand by mass spectrograph? Describe the principle of Aston's mass spectrograph.

(b) Give in brief the mode of operation of a scintillation counter and describe how it may be used to study nuclear reactions.

7. Attempt any *one* part of the following: 10 x 1 = 10

(a) Discuss about Agriculture Applications of Nuclear Techniques.

(b) Write short notes on Positron Emission Topography.