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B.TECH.

THEORY EXAMINATION (SEM–IV) 2016-17

NUCLEAR SCIENCE

Time : 3 Hours *Max. Marks : 100*

SECTION-A

1 **Attempt all parts in short.** **(10×2=20)**

a) Write down the properties of nuclear forces.

b) What is mass defect?

c) Define quadrupole moment.

d) What is semi-empirical mass formula?

e) Write down the various nuclear models.

f) Define mean life and write down the relation between mean life and half life.

g) Give the principle of Aston Mass Spectrograph.

h) Explain briefly about Synchrotron.

i) What is cloud chamber?

j) Write down the application of radiotracer technique in material science and agriculture.

SECTION-B

2 **Attempt any five of the following.** **(10×5=50)**

a) Describe the Electron Scattering Method to determine the radius of nucleus.

b) Discuss the collective model of nucleus. How does the collective model help in understanding the phenomenon of nuclear fission?

c) Discuss the limitations and failures of single particle and shell model.

d) What are various types of nuclear reactions and conservation laws of nuclear reaction?

e) What is radioactive decay? Explain decay constant and half life of a radioactive element.

f) Explain Gamow, theory of alpha decay. How is Geiger-Nuttal law derived from it?

g) What is the particle accelerator? Describe the working of Van de Graph Accelerator. What are its advantages and limitations?

h) Discuss principle and working of Scintillation counter. Discuss merits of Scintillation counter.

SECTION-C

Attempt any two questions from this section. **(15×2=30)**

3. What do you mean by nuclear binding energy? How the concept of binding energy is related to the stability of atomic nucleus. Calculate the binding energies of the following isobars and their binding energies per nucleon.

$_{28}Ni^{64}$ = 63.9280 mu, $_{29}Cu^{64}$= 63.9298 mu [M_N= 1.008665 mu and M_H=1.007825 mu].

4. Explain the various components of a nuclear reactor and describe its construction and working.

5. Discuss the interaction of nuclear radiation with matter in detail.

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