SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2024
(Regular/Improvement/Supplementary)
PHYSICS
GPHY6B12T: NUCLEAR PHYSICS AND PARTICLE PHYSICS

Time: 2 Hours   **Maximum Marks: 60**

SECTION A: Answer the following questions. Each carries *two* marks.

(Ceiling 20 Marks)

1. Define Binding Energy of nucleus.
2. What are magic numbers?
3. Explain alpha decay with an example.
4. What are the conditions under which nuclear fusion occurs?
5. What is nuclear reaction? Give an example.
6. Give two medical applications of nuclear reactions.
7. What are transuranic elements?
8. What is nuclear radiation detector?
9. Explain the principle of working of linear accelerator.
10. Name the four basic forces in nature.
11. What are fermions and bosons?
12. Give the quark composition of protons and neutrons.

SECTION B: Answer the following questions. Each carries *five* marks.

(Ceiling 30 Marks)

13. Find the total binding energy and binding energy per nucleon for $^{133}Cs_{55}$.
    Given m_n = 1.008665 u, $m(^1H_1)$ = 1.007825 u, m(Cs) = 132.905452 u.
14. Derive an expression for reaction cross-section.
15. Explain the essential parts of nuclear reactors.
16. Briefly explain Geiger-Muller counter.
17. Explain surface barrier detector.
18. A cyclotron with dees of diameter 1.8 m has a magnetic field of 0.8T. Calculate the energy of an accelerated proton.
19. Calculate radius needed in proton synchrotron to attain particle energies of 10 GeV. Assume the magnetic field available is 1.5 T.

SECTION C: Answer any *one* question. Each carries *ten* marks.

20. Explain postulates of liquid drop model. Derive Weizsacker semi empirical mass formula.
21. Derive an expression for relativistic threshold kinetic energy of particle reactions of elementary particles.

(1 x 10 = 10 Marks)