UNIVERSITY OF GUJRAT

A WORLD CLASS UNIVERSITY

(Physics)

(M.A/M.Sc Part-II)

Nuclear Physics

Roll No: _____

Time Allowed : 3 hrs
Max. Marks : 100

Attempt any **FIVE** Questions, selecting at least **ONE** from each section.
All questions carry equal marks

SECTION I

1- a) Describe the principle and working of CYCLOTRON. Why it is not suitable to accelerate the charged particle to higher energies. How this difficulty is removed in SYNCHROCYCLOTRON. 10,2,4

b) What is ELECTRIC QUADRUPOLE MOMENT of Nucleus? What information does it provide about shape of nucleus? 4

2- a) Describe the Construction and Working of MASS SPECTROGRAPH. How nuclear masses are determined with it and ISOTOPES are detected? 10, 5

b) Explain the Terms BINDING ENERGY and MASS DEFECT. 5

SECTION II

3- a) Give in full detail the FERMI THEORY of β-decay. 15

b) Explain NEUTRINO HYPOTHESIS. 5

4- a) Write down the Essential Features of LIQUID DROP MODEL of Nucleus. 10

b) What are MAJIC NUMBERS, how they can be explained on the basis of SHELL model of Nucleus? 10

5- a) What is Q-value of nuclear reaction? Find Q-value of reaction ^{14}N (α, þ)^{17}O. Mass of ^{14}N = 14.00307u, Mass of ^{4}He = 4.00260u, Mass of ^{1}H = 1.00783u and Mass of ^{17}O = 16.991u. 5, 5

b) Explain DIRECT REACTIONS in detail. 10

SECTION III

6- a) What are different NEUTRON SOURCES? Briefly explain these sources. 12

b) Explain THERMONUCLEAR PROCESS. How energy is released in Nuclear Fusion? 8

7- a) What are different Reaction Cross Sections? How they are measured? What are their Applications? 15

b) Explain the Terms NUCLEAR ENERGY LEVELS, LEVEL WIDTH, PARTIAL LEVEL WIDTH and AVERAGE SPACING of Energy Level. 5

8- a) Consider an ENDOTHERMIC reaction: a + X = Y + b
Find out threshold energy for this process. 10

b) Collective Model combines certain features of Shell Model and Liquid Drop Model of nucleus. Discuss this model. 10

9- Write notes on any Two of following: 10, 10

a) Nuclear Fission
b) Semi Conductor Detector
c) Isotopic Spin