(i) Printed Pages : 3 Roll No. .....

(ii) Questions : 7 Sub. Code : 1 7 4 5 0

Exam. Code : 0 0 0 5

B.A./B.Sc. (General) 5th Semester

(2124)

PHYSICS

Paper C : Nuclear and Particle Physics—I

Time Allowed : Three Hours] [Maximum Marks : 44

Note :— (i) Attempt *five* questions in all, selecting *two* questions each from Unit I and Unit II. Unit III is compulsory.

(ii) Use of non-programmable calculator is allowed.

UNIT—I

1. (a) What is binding energy of nucleus ? Show how the concept of binding energy is related to stability of atomic nucleus.

(b) Show that nuclear density is independent of mass number. 6,3

2. What are the assumptions of liquid drop model of the nucleus ? Estimate various terms of semi-emipirical mass formula. What are the failures of this model ? 9

3. (a) What is Electric quadrupole moment of nucleus ? Discuss shapes of nucleus on the basis of it.

(b) A nucleus of mass number 125 has radius 6 Fermi. Find the radius of nucleus having mass number 64. 6,3

UNIT—II

4. (a) What is radioactive decay ? Deduce the laws of radioactive decay and explain the term disintegration constant.

(b) The half-life of radon is 3.8 days. After how many days, one percent of radon will be left behind. 6,3

5. (a) Describe the process of electron capture, electron emission and positron emission.

(b) Explain the distance of closest approach and derive an expression for it. 6,3

6. (a) What do you mean by Q-value of a nuclear reaction ? Derive an expression for it in terms of kinetic energies of product and incident particles and their masses.

(b) What is nuclear fission ? Discuss the source of energy released during fission. 6,3

UNIT—III

7. Attempt any *eight* parts :

(a) Nuclear forces are short-range forces. Explain.

(b) What is Parity ? Explain.

(c) What is the function of carbon rods in the nuclear reactor ?

(d) Name the four radioactive series.

(e) How does the atomic number and mass number change during alpha and beta decay ?

(f) What are magic numbers ?

(g) What are pick-up and stripping reactions ?

(h) Define thermal neutrons.

(i) What do you understand by nuclear spin ?

(j) Find a relation between electron volt and atomic mass unit.

$1 \times 8 = 8$