Roll No. .....

(01/22-II)

5238

B.Sc. EXAMINATION

(Fifth Semester)

PHYSICS

PH-502

Nuclear Physics

Time : Three Hours *Maximum Marks :* 40

Note : Q. No. 1 is compulsory and attempt *one* question from each Unit. In total *five* questions *one* to be attempted.

1. (i) What is one electron volt ? Calculate one electron volt in terms of Joule for an electron. 2

(ii) The absorption coefficient of lead for 1 MeV γ-rays is 0.75 cm^{-1}. Determine thickness of lead sheet required to reduce the γ-rays intensity to 10%. 2

(iii) Write the principle of working for a

G. M. Counter. 1

(iv) Write the nuclear fission reaction for $_{92}U^{235}$ nucleus. 2

(v) What is neutrino hypothesis ? Explain. 1

Unit I

2. (a) What is proton-electron hypothesis for nuclear structure ? 2

(b) Write down failures of proton-electron hypothesis for nuclear composition. 6

3. (a) Calculate radii of two product nuclei after splitting of a nucleus having mass number (A) equal to 235. If the ratio of mass numbers of products is 2 : 1. 4

(b) Draw and explain binding energy curve of nuclides. 4

Unit II

4. Discuss the process by which heavy charged particles like α-particle interact with matter and derive an expression for stopping power. 8

5. (a) Derive absorption law of γ-rays. 6

(b) What is mass absorption coefficient for a material ? 2

Unit III

6. (a) What is the principle of working of betatron accelerator ? Derive betatron condition for flux density (B). 5

(b) Draw and explain structure of betatron. 3

7. (a) Calculate the maximum energy of beam of protons accelerated by cyclotron having dees radius 40 cm and B (magnetic induction) 1.5 T. 4

(b) What is surface barrier detector as a semiconductor detector ? Explain with structure. 4

Unit IV

8. (a) State *four* conservation laws for a nuclear reaction. 4

(b) Discuss elastic and inelastic scattering type nuclear reactions. 4

7. Explain the threshold condition for laser emission, line broadening mechanism, homogeneous and inhomogeneous line broadening. 8

Unit IV

8. Discuss the principle, construction and working of semiconductor laser. 8

9. Discuss the principle, construction and working of Ruby laser. 8