

(i) Printed Pages: 3 Roll No.

(ii) Questions : 7 Sub. Code :

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Exam. Code :

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B.A./B.Sc. (General) 6th Semester

1059

PHYSICS

Paper-C : Nuclear and Particle Physics-II

Time Allowed : Three Hours]

[Maximum Marks : 22

Note :— (1) Attempt **FIVE** questions in all, selecting **TWO** questions each from Unit-I and Unit-II. Question No. 7 (Unit-III) is compulsory.

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

UNIT—I

1. (a) Derive Bohr's formula for the energy loss of heavy charged particle through matter and explain the modification of Beth Bloch formula. 3

(b) What is a Bremstrahlung ? 1.5

2. (a) What are gas filled ionization based nuclear detectors ? Discuss the curve between pulse height and applied voltage for a gas filled counter serving as (i) an ionization counter (ii) a proportional counter (iii) a Geiger Muller Counter. 3

- (b) A GM counter collects 10^8 electrons/discharge when the counting rate in 500 counts/min. What will be the average current in the circuit ? 1.5
3. (a) Write a short note on following :—
- (i) Electron positron annihilation
- (ii) Cerenkov radiations. 3
- (b) Is it possible for a photon to transfer its entire energy to the electron in Compton process ? Explain. 1.5

UNIT—II

4. (a) Describe in detail the principle, construction, theory of Tandem accelerator. 3
- (b) A cyclotron oscillator frequency of 1 MHz is used to accelerate protons. If the radius of the dee is 60 cm, find the magnetic field in tesla. 1.5
5. (a) Discuss the quantum numbers associated with elementary particles. Give the corresponding conservation laws. 3
- (b) Compare the properties of particles and anti particles. 1.5
6. (a) What are the constituents of primary and secondary cosmic rays ? Give their origin and production in atmosphere. Also discuss the phenomenon of cosmic ray showers. 3
- (b) What are quarks ? Give their properties. 1.5

UNIT—III

7. Attempt any **EIGHT** parts :—

- (a) What is the basic principle of linear accelerator ?
- (b) Calculate the energy of a γ ray photon required to produce a proton and antiproton of K.E. 10 MeV each. Given mass of proton = 1.007825 a.m.u.
- (c) Does the Compton shift depend upon the nature of scatterer ?
- (d) What do you mean by charge conjugation ?
- (e) What are the limitations of Cyclotron ?
- (f) Give the properties of semiconductor radiation detectors.
- (g) What is straggling ?
- (h) What do you mean by Pair Production ?
- (i) What is the principle of Van-De Graaff generator ?
- (j) Distinguish between synchro-cyclotron and cyclotron.

$$0.5 \times 8 = 4$$