Exam. Code : 103206

Subject Code : 1408

B.A./B.Sc. Semester—VI

PHYSICS

(Particle Physics)

Paper—B

Time Allowed—3 Hours]   [Maximum Marks—35

Note :— All parts of question 1 in Section A are compulsory. Attempt **ONE** question from each Section B, C, D and E. All questions carry equal marks.

SECTION— A

1. (a) Explain why Compton effect cannot be demonstrated with visible light.

   (b) Write down the mathematical expression for Bethe-Bloch formula. What is the significance of this formula ?

   (c) What is the principle of a bubble chamber ?

   (d) How electron synchrotron is different from proton synchrotron ?

   (e) What is the function of thallium (Tl) activator in NaI scintillation detector ?

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(f) Write down the similarities and differences between a photon and a neutrino.

(g) Define an elementary particle. Is neutron elementary particle ? 7×1=7

SECTION—B

2. Write a note on the following :

(a) Bremsstrahlung radiation

(b) Straggling. 4,3

3. Describe the three main processes by which gamma-rays interact with the matter. How does the interaction probability of these processes depend upon the nature of the matter and the energy of the gamma-rays ? 7

SECTION—C

4. Discuss the principle and working of the following detectors :

(a) Nuclear emulsion

(b) Solid State Nuclear Track Detector (SSNTD). 4,3

5. Discuss the principle, construction and working of a G. M counter. Why internal quenching is required in GM tube ? 7

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SECTION—D

6. Describe the principle, construction and working of betatron. Obtain the betatron condition.   7

7. Write a detailed note on colliding beam machines. What are the advantages and disadvantages of colliding beam experiments over fixed target experiments ?

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SECTION—E

8. (a) Explain with suitable examples the conservation law of baryon number, lepton number and strangeness.   3

   (b) Which conservation law is violated in the following interactions ?

      (i) $\Lambda^0 \to K^0 + \pi^0$

      (ii) $K^- \to \pi^0 + e^-$

      (iii) $p + n \to p + \Lambda^0$

      (iv) $n \to p + \gamma$.   4

9. Describe the various properties of quarks and antiquarks. On the basis of these properties determine the quark content of antiproton, antineutron, K^+, and K^0.   7