

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 (TI) activator in NaI scintillation detector ?

- (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

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 ? 7

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) $\Lambda^0 \rightarrow K^0 + \pi^0$
- (ii) $K^- \rightarrow \pi^0 + e^-$
- (iii) $p + n \rightarrow p + \Lambda^0$
- (iv) $n \rightarrow p + \gamma$. 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