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Class – B.Sc(Sem.-VI)
Subject – 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) What is the dead time and resolving time of a G.M. counter?

(b) Why electron-positron pair production process cannot occur in a vacuum?

(c) What is Compton wavelength? Calculate its value for electron for maximum shift.

(d) In a linear accelerator, are the particles accelerated in the gaps or in the drift tubes?

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

(i) $n \rightarrow p + e^-$

(ii) $p + e^- \rightarrow \gamma$

(f) What are fermions? Name their sub-groups.

(g) What is the principle of a linear accelerator?

SECTION-B

2. Derive Bethe-Bloch formula for the loss of energy of a heavy charged particle passing through matter.

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3. Compare the processes of photo-electric effect, Compton effect and pair-production. Why photoelectric effect does not occur for free electrons?

SECTION-C

What are gas-filled ionisation detectors? Discuss the difference between the ionisation in the chambers proportional counter and G.M. counter. What are their advantages and disadvantages?

5. What is the principle of scintillation detector? Explain the construction and working of the scintillation detector?

SECTION-D

6. What is Synchrotron? Explain the working mechanism of electron synchrotron and proton synchrotron.

7. Explain the principal, construction and working of cyclotron. Why electrons cannot be accelerated in cyclotron?

SECTION-E

8. (a) Give a comparison between Leptons and Baryons. 3

(b) What is strange about strange particles? Write the Gell-Mann-Nishijima relation. 3,1

9. Explain the following terms :

(a) Isopin

(b) Charge conjugation 2,2,3

(c) Anti-particles

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