Roll No. .....

Total No. of Questions : **9**] [Total No. of Printed Pages : **4**

(2034)

UG (CBCS) IIIrd Year Annual Examination

2999

B.Sc. PHYSICS

(Nuclear and Particle Physics)

(DSE-1B)

Paper : PHYS 304 TH

Time : 3 Hours] **[Maximum Marks : 70**

Note :– Attempt *five* questions in all, selecting *one* question from each Section. Question No. **1** is compulsory.

Section–A

(Compulsory Question)

1. (i) What is the significance of Nuclear Quadrupole Moment ?

   (ii) What is Parity ? Explain.

   (iii) What are the limitations of shell-model ?

   (iv) What is the principle of carbon radioactive dating ?

(v) Explain Q-value of a nuclear reaction and its significance.

(vi) What is nuclear reaction's cross-section ?

(vii) Why visible light cannot be used to demonstrate Compton effect ?

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

(ix) What are the distinct advantages of Scintillation counter ?

(x) What is Betatron and how does it differ from cyclotron ?

(xi) What is Strangeness(S) ? Why are strange particles so called ? 11×2=22

Section–B

2. (a) What are nuclear forces ? Explain their main properties.

(b) The mass of $_{17}Cl^{35}$ is 34.9800 a.m.u. Calculate its binding energy. What is the binding energy per nucleon ? Given mass of proton = 1.007825 a.m.u., mass of neutron = 1.008665 a.m.u. 6×2=12

3. Discuss the basic assumptions of the liquid drop model of the nucleus. Explain how the model is used to estimate the semi-empirical mass formula. 12

Section–C

4. What led Pauli to put forward the neutrino hypothesis ? Give elementary theory of β-decay. 12

5. Write notes on the following :

   (a) Compound nucleus

   (b) Nuclear cross-section 6×2=12

Section–D

6. Derive Bethe-Bloch's formula for the energy loss of a particle passing through matter. 12

7. Describe principle, construction and working of G.M. counter. What do you mean by dead time of G.M. counter. 12

Section–E

8. What is synchrotron ? Give the constructional details and working of proton synchrotron. 12

9. Write short notes on the following :

(a) Hyper charge

(b) Baryon number

(c) Lepton number

(d) Isospin

(e) Decay process of mesons

(f) Isotopic spin

6×2=12