(i) Printed Pages : 3 Roll No. .....

(ii) Questions : 9 Sub. Code : 3717

Exam. Code : 0474

M.Sc. Physics 3rd Semester

(2123)

PARTICLE PHYSICS—I

Paper—Phy-8032

Time Allowed : Three Hours] [Maximum Marks : 60

Note :— Attempt **FIVE** questions in all, selecting **ONE** question each from Units I to IV. Unit-V is compulsory to attempt.

UNIT—I

1. (a) Draw and explain the following electromagnetic processes by using Feynmann Diagrams : Pair Production, Bremstraullung, Photoelectric effect, Rutherford scattering. Self energy and Quark--Gluon interactions. 5

(b) Give Baryon number, Strangeness, Isospin and quark content for the following :

π^0, K^+, K^0, Ω, λ, Σ^+. 4

(c) Explain Dirac theory of antiparticle. 3

2. (a) Distinguish between strong, weak and E.M. Interaction on the basis of decay rates, cross-section and purity conservation. Give one example of each type of interaction. 5

(b) Show that according to Yukawa theory the range of a field is given by the Compton wavelength of the associated interaction. 4

(c) What are strange particles ? Discuss the Gell-Mann Nishijima Scheme to the classification of the particles. 3

UNIT—II

3. (a) Describe the invariance in classical and quantum mechanics. 6

(b) What is iso-spin ? How its concept was introduced ? Write down the iso-spin for two nucleon system and pion nucleon system. 6

4. (a) What is G-parity ? Determine G-parity for a system of n-pions. 4

(b) Explain CPT theorem. Give two of its important consequences. 4

(c) What is parity ? Explain pion parity. 4

UNIT—III

5. (a) Show that the quark level assignment in Decuplet of Baryon state of spin and parity $\frac{3_+}{2}$ using the quark model and explain various characteristics the quark model. 6

(b) What are Dalitz plots ? Discuss these by taking the example of three dissimilar particles. 6

6. (a) What is Breit–Wigner Resonance formula ? Explain its applications for the scattering of two elementary particles. 6

(b) Discuss τ-0 puzzle and also explain the significance of color quantum number. 6

UNIT—IV

7. (a) What are Fermi and Gammow–Teller Transition ? Explain Fermi theory of nuclear β-decay. Also find the value of Fermi constant G. 6

(b) Explain why CP-is violated in weak interaction ? Discuss experimental determination of CP–violation in K°-decay. 6

8. (a) Give the classification of weak interaction and describe the parity violation in β-decay with experimental evidence. 6

(b) What is Helicity ? Explain the Helicity of neutrino. 6

UNIT—V (Compulsory)

9. (a) What are quarks ? Explain its flavour.

(b) Why is the decay $p^0 \rightarrow 3\gamma$ forbidden.

(c) Explain OZI rule with example.

(d) Give three examples each for the weak interactions. $|\Delta S| = 0$ amd $|\Delta S| = 1$

(e) What is difference betweenQCD and QED ?

(f) Why Gluons are bi-colored ? $6 \times 2 = 12$