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

(ii) **Questions : 9** **Sub. Code : 3 7 1 1**

Exam. Code : 0 4 7 3

M.Sc. Physics 2nd Semester

1059

PARTICLE PHYSICS–I

Paper–PHY-6013

Time Allowed : Three Hours] **[Maximum Marks : 60**

Note :– Attempt **five** questions in all, selecting **one** each from Unit–I to Unit–IV. Unit–V is compulsory.

UNIT–I

I. (a) Explain major conservation laws used in particle physics. How do these laws explain the types of particle interactions that may or may not occur ?

(b) Write quark content, strangeness and I_z for Λ, ρ^+, k^o,Σ^+ and Ξ^-.

(c) Why do we require high energy to study elementary particles ?

5,5,2

II. (a) Explain the following in detail :

(i) QED

(ii) QCD.

(b) Draw Feynman diagrams for Bremsstrahlung and pair production. 10,2

UNIT–II

III. (a) What do you mean by time reversal invariance ? Describe time reversal invariance in classical and quantum mechanics.

(b) State CPT theorem and discuss its consequences. 6,6

IV. (a) Find the isospin wavefunction for pion-nucleon system and calculate the relative cross sections at fixed energy.

(b) Show that spin of charged pion is zero. 8,4

UNIT–III

V. (a) What is Breit-Wigner formula ? Explain its application for two particle forming resonant states.

(b) What are Dalitz plots ? Explain Dalitz plots taking the example of k-3π decay. 5,7

VI. (a) Discuss the Gell-Mann-Okubo mass formula for baryon octet and meson octet.

(b) What are particular combinations of $u\bar{u}$, $d\bar{d}$ and $s\bar{s}$ corresponding to neutral states (π^o, ρ^o, η, η', ω and ϕ) ? 7,5

UNIT–IV

VII. (a) Describe parity violation in nuclear β–decay with experimental evidence.

(b) Show that $\Delta I = \frac{1}{2}$ rule is applicable to non-leptonic decay.

(c) Write two examples each of weak interactions with $|\Delta S| = 0$ and $|\Delta S| = 1$. 7,5

VIII. (a) Explain CP violation in K°-decay and its experimental determination.

(b) Describe K° and $\bar{K}^{\circ}$ mixing through intermediate pion states leading to 2π and 3π states with CP = ± 1. 7,5

UNIT–V

IX. (a) What do you mean by isospin ? Explain.

(b) Why the hadrons are colorless ?

(c) Explain the term rapidity.

(d) What do you mean by universality of weak interactions ?

(e) Explain the terms :

(i) Quark confinement

(ii) Asymptotic freedom

(iii) Renormalization. 2,2,2,3,3