Roll No. Total No. of Pages : 02

Total No. of Questions: 20

M.Sc. (Physics) (Campus) (2016 Onwards) (Sem.-3)
PARTICLE PHYSICS

Subject Code: PHS-533 M.Code: 51224

Time: 3 Hrs. Max. Marks: 70

INSTRUCTIONS TO CANDIDATES:

- 1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
- 2. SECTION-B contains SEVEN questions carrying FIVE marks each and students have to attempt any SIX questions.
- 3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

- 1. What is the theory of fundamental interaction between quarks?
- 2. Draw the meson octet of J^P=0⁻ multiplet of SU (3) gauge group.
- 3. Explain why a baryon of spin 1 cannot exist according to the quark model?
- 4. How will you distinguish between strong and weak forces?
- 5. Differentiate between mesons and baryons? What values of electric charge is possible for mesons?
- 6. What do you understand by quark model of particle physics?
- 7. "*Nucleon is a doublet under SU(2)*". Comment.
- 8. What are the self-conjugate particles?
- 9. Why single quark do not exist in nature but two or three quarks do exist?
- 10. How strangeness, hypercharge and isopin are related in context of electric charge?

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SECTION-B

- 11. Explain the method used by Wu and Shaknov to prove that fermions and anti-fermions have the opposite parity.
- 12. Show that negative energies are simply associated with the destruction operators acting on positive energy particles to reduce the energy within the system.
- 13. Describe the properties of the various types of pion and discuss in detail the experiments which have been carried out to determine their spin, parity, and isospin.
- 14. If a K_S^0 meson at rest decays in 0.900×10^{-10} sec, how far will a K_S^0 meson travel if it is moving at 0.960c through a bubble chamber?
- 15. Mention the list of leptons with their quantum numbers like mass, parity, spin, life time and Lepton number.
- 16. What is the evidence for another quantum number "Color", under which the strong interactions are exactly symmetric? How many colors are there believed to be?
- 17. Explain five fundamental conservation laws used in particle physics in context to the electromagnetic interaction.

SECTION-C

- 18. What is a charge conjugation operator? How it is defined for the particles like pions, photon and neutrinos? Discuss the conservation of C and CP and CPT(together) in weak interaction.
- 19. Using general relativistic mass energy conservation term between energy(E), momentum(P), and mass(m), derive the Dirac wave equation for free particle in the covariant form.
- 20. Describe with a table the particle content of the standard model of particle physics. Show how the particles can be divided into bosons and fermions, and indicate why some particles appear in generations?

NOTE: Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

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