Dr K. K Sharma (23) 30/11/2022 (M)

National Institute of Technology Hamirpur, Department of Physics & Photonics Science
End Semester Exam. Nov. 2022 Class: M. Sc (Physics) 2nd year
Semester: 3rd Roll No. :.....
Subject: High Energy Physics Code: PH-631
Time: 3hrs MM: 50
Note: All questions are compulsory

Q.1 Discuss the classifications of particles. (3)

Q.2 Explain (i) quark model (ii) Gell-Mann Nishijima scheme. (3)

Q.3 Discuss $\tau - \theta$ puzzle. (2)

Q.4 Discuss CP violation in K-decay processes. (3)

Q.5 What are Feynman diagrams? Draw and explain Feynman diagrams for basic e.m. processes. (3)

Q.6 Using quark-gluons interaction and the confinement hypothesis explain why quarks do not exist free? (3)

Q.7 Discuss the classifications of weak interactions. Distinguish between weak – charged current and weak- neutral current interactions. (3)

Q.8 Write the structures of scalar, pseudoscalar, vector, axial-vector, antisymmetric tensor which can be constructed using γ-matrices and Dirac spinors. (3)

Q.9 Explain V-A structure of weak current. (3)

Q.10 Discuss the concept of gauge transformation. Explain global and local gauge invariance. (3)

Q.11 Discuss various types of particle interactions giving their characteristic coupling constant, lifetimes and interaction carriers. (3)

Q.12 Discuss the Fermi-theory of beta decay and the concept of parity violation. Discuss the experiment which proved that parity is violated in weak decays. (4)

Q.13 Discuss SU(3) flavour symmetry for baryons and mesons. Draw the appropriate I_3-S diagram showing quark-label assignments in a baryon decuplet and pseudoscalar mesons. (4)

Q.14 Discuss the Cabibbo's theory of weak interactions. With the help of Feynman diagram explain the cancellation of unwanted weak neutral currents through GIM mechanism. (5)

Q.15 Discuss the electromagnetic interaction of a charged particle with electromagnetic field represented by 4-vector potential A^μ and obtain the expression for the transition amplitude in terms of A^μ and 4-vector current density j^μ. Also draw the Feynman diagram showing this interaction. (5)