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DD282

M. Sc. EXAMINATION, 2020

(Fourth Semester)

(B. Scheme) (Re-appear)

PHYSICS

PHY604B

Advance Quantum Mechanics
and Elements of Particle Physics

Time : 2½ Hours] [*Maximum Marks :* 100

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Four* questions in all. All questions carry equal marks.

1. (a) Deduce an expression for charge and current densities of Dirac equation.

(b) Show that why the dimension of Dirac matrices have to be even ? Also show that, how Dirac matrices have been constructed through Pauli matrices ?

2. Show that for a spin half (1/2) particle the magnetic moment is always given by $\mu = -(q\hbar/2m)\sigma$, here the symbols are having their usual meaning.

3. How the second quantization is done ? Illustrate the mechanism of second quanitization with Schrödinger field.

4. (a) Obtain the classical field equation in terms of Lagrangian density.

(b) Discuss the steps for canonical quanitization of a field.

5. Write the general form of a scattering matrix, explain the variable appeared in this expression. Discuss the way of quantization of Dirac field.

6. Draw the Feynman diagram showing the electron-electron scattering, electron-proton scattering, scattering of an electron by a potential and photon by an electron. Also list the Feynman rules for sketching these diagrams.

7. (a) Illustrate the invariance of C, P and T. Also state the CPT theorem.

(b) Which are the additional quantum numbers needs to conserve for reactions involving elementary particles discuss with appropriate examples.

8. (a) Draw a plot of strangeness versus charge number for spin ½ baryons also give their quark composition. Also discuss that, why must the quark in hadrons have different colors ?

(b) How the elementary particles are being classified ? Discuss their classification based on their spin.