DEPARTMENT OF SCIENCES, M. Sc. (Physics)
IV SEMESTER, END SEMESTER EXAMINATIONS
MAY 2022
Subject: THEORETICAL PHYSICS II (PHY-6015)
(CHOICE-BASED CREDIT SYSTEM - 2020)

Time: **3 Hours**   **Date**: May **2022**   **MAX. MARKS**: **50**

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Note: **(i) Answer all the questions.**
        (ii) Answer the questions to the point. Show all the
calculation steps.

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1. Explain: **[2×5]**
(i) Fock space,
(ii) time ordering,
(iii) Landau gauge,
(iv) S-matrix,
(v) one particle irreducible diagrams.

2. (i) Write the expression of Lagrangian of a complex field. Obtain
the equation of motion and Hamiltonian from the Lagrangian.   [4]
(ii) Write and derive the Noether theorem.   [6]

3. (i) Discuss the Fourier decomposition of the Dirac field.   [5]
(ii) What is Gupta-Bleuler modification for electromagnetic fields?   [5]

4. Show that $U(t) = \mathcal{T}[exp(-i \int_{-\infty}^{t} dt' H_I(t'))]$. **   [10]**

5. (i) Briefly discuss about the amplitudes which are not S-matrix
elements.   [5]
(ii) Obtain a relation between decay rate and transition matrix el-
ement.   [5]

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