



## DEPARTMENT OF SCIENCES, M. Sc. (Physics) IV SEMESTER, END SEMESTER EXAMINATIONS APRIL 2020 Subject: THEORETICAL PHYSICS II (PHY-5014) (REVISED CREDIT SYSTEM - 2017)

Time: 3 Hours Date: April 2020 MAX. MARKS: 50

Note: (i) Answer all the questions. (ii) Answer the questions to the point.

1. (i) Prove that  $[\phi(\vec{x},t),\pi(\vec{y},t)] = i\delta^3(\vec{x}-\vec{y})$  is covariant. [5] (ii) Write the Feynman rules for a scattering process. [5]

2. (i) Obtain a relation between decay rate and transition matrix element. [5]

(ii) Obtain the expression of propagator for Dirac field. [5]

3. (i) Construct the electromagnetic field strength tensor matrix. [5]

(ii) What modifications are done to the classical Lagrangian of free electromagnetic fields to quantize it? [5]

4. (i) Calculate the scattering amplitude of electron - electron scattering. [5]

(ii) What are virtual, on - shell, and off - shell particles? [3](iii) What do you mean by gauge fixing? [2]

5. (i) What type of theories are non - renormalizable?[5](ii) How many types of regularization methods are there?[3](iii) What is ultra - violet divergence?[2]