

## Homework 2 (10 points)

1. Obtain the covariant form of the Maxwell equation (I and III parts) for the case when sources are available.
2. Obtain the (II and IV) parts of Maxwell equation from the Electromagnetic Tensor  $F_{\mu\nu}$
3. Suppose the Lagrange density depends independently on the field  $\phi$  and derivative field  $\partial_\mu \phi$ . From the minimal action principle obtain the Euler - Lagrange equation for the field  $\phi$ .
4. From equation  $\partial_\mu \partial^\mu A^\nu = 0$  obtain the current conservation for 4 - vector of photonic current  $j^\lambda = (\rho, \vec{j})$ . From the condition of one photon in the volume V. Define the normalization of the wave function of the free photon wave function.
5. Consider the Compton Scattering, and calculate the dependence of the energy of recoil particle from the recoil angle for the case in which photon is a massless particle.