

# Online Assignment Questions

(Based on 30<sup>th</sup> and 31<sup>st</sup> March, 2020 Online Lectures)

1. Calculate the component of  $F^{*ik}$  in terms of  $\mathbf{E}$  and  $\mathbf{B}$ .
2. Show that  $\partial^i F^{kl} + \partial^k F^{li} + \partial^l F^{ik} = 0$ .
3. Obtain all the components of Minkowski Force and show that they can be generalised as  $K^i = \frac{q}{c} F^{im} U_m$ .
4. Obtain the relation  $F_{ik}^* F^{ik} = -4\mathbf{E} \cdot \mathbf{B}$ .
5. Calculate the Following Scalars :-
  - a)  $G^{ik} G_{ik}$
  - b)  $G_{ik}^* G^{ik}$
  - c)  $G^{ik} F_{ik}$
  - d)  $F^{ik} G_{ik}^*$
  - e)  $G_{ik}^* F^{*ik}$
6. Show that generalised momentum for a free particle  $\mathbf{P} = \mathbf{p}_{rel}$ .
7. Calculate the Hamiltonian  $\mathbf{H}$  of the free particle by using the known value of generalised momentum  $\mathbf{P}$  and Lagrangian  $\mathbf{L}$  of the particle.
8. Find out the interaction part of the Lagrangian .i.e.,  $L_{int}$  for a charged particle moving inside the EM field.
9. Obtain the Homogeneous Maxwell's equations  $\partial_i F^{*ik} = 0$  from  $\partial_i F^{ik} = \frac{4\pi}{c} J^k$ .