

Assignment #2

(due to Monday, February 05, 2017)

1. A parallel plate capacitor was charged and then disconnected from the battery. It is discharged due to finite conductivity σ of the media between the plates. The dielectric permittivity is ϵ . Find the conduction current density and the total current density inside the capacitor as a function of time. Find the flux of the electromagnetic energy from the space between the plates.

(20 Points)

2. Derivate from the Maxwell equations and the scalar and vector potential definitions the wave propagation equations:

$$\Delta\phi + \partial_t \nabla \cdot \vec{A} = -\rho / \epsilon_0$$
$$\Delta \vec{A} - \frac{1}{c^2} \partial_t^2 \vec{A} - \nabla \left(\nabla \cdot \vec{A} + \frac{1}{c^2} \partial_t \phi \right) = -\mu_0 \cdot \vec{j}$$

(20 Points)

3. Dispersion relations: Problem 7.20 (a) thru (c), Jackson textbook (page 347).

(30 Points)

4. Kramers-Kronig: Problem 7.22 (a) and (b), Jackson textbook (page 348).

(30 Points)