ECE 604 Electromagnetic Field Theory
Spring 2020

Homework No. 1. Due Date: Jan 22, 2020

,

Read lecture notes 1, 2, and 3.

1. For Lecture 1:
(i) Explain why the electric flux going through ΔS_1 and ΔS_2 are the same in Figure 1.8.
(ii) Find the answer in Example 1.
(iii) Find the answer in Example 2.
(iv) Find the answer in Example 3.
(v) Given an infinitely long cylindrical circular wire carrying a DC current *I*, find the magnetic field around the wire using symmetry argument, and Ampere's law.

2. For Lecture 2:
(i) By going through proper flux counting, show that (2.1.9) is valid.
(ii) By going through the math carefully, show that (2.11) is correct.
(iii) Explain why Stokes' theorem can be generalized to curved surfaces.
(iv) In Section 3 of Lecture 2, show that for the four Maxwell's equations, equations (2.3.3) and (2.3.4) are derivable from the first two Maxwell's equations.
(v) Explain why this derivation is not valid for static electromagnetic fields.
(vi) By converting the current continuity equation into integral form, explain why it is the same a charge conservation.

3. For Lecture 3:
(i) Show that (3.2.14) and (3.2.15) are solutions to (3.2.12) and (3.2.13), respectively.
(ii) For static electromagnetics, explain why when a resistive medium exists, the electrostatic system is not decoupled from the magnetostatic system.
(iii) Explain why (3.3.16) is the solution to (3.3.15).
(iv) Find the answer to Examples in this lecture.
(vi) Show that your solution to Example 3 is in agreement with the solution of Problem 1.(iii) above.