Physics-306
Homework Set (4)

This set is due by Sunday 9th of Jumada-II, 1436 (29th of March, 2015) at 10.00 p.m. (*).

In *all homeworks*, please solve *fully* and *clearly*, *state assumptions*, and *comment* wisely (when applicable).

Please circle your final answer.

Feel free to study from books, and discuss with your instructor, but do *not* consult others (colleagues, professors, electronic forums…etc.) for this problem set!

I wish you well, wa assalam alaikum!!

Zain Yamani
Phys-306 Instructor

(*) slip it under my Office door, in 15-3100

Question-1:
Use Maxwell's Equations to describe electromagnetic waves in:
- i- Free space
- ii- Dielectrics, and
- iii- Conductors

Question-2:
Calculate the transport of electromagnetic energy and momentum in an electronic wave propagating in (pure) water.

Question-3:
Use complex notation for waves propagating on a string, reflecting/ transmitting at a boundary. Find the ratio (and phase) between the reflected wave and the incident one, and similarly between the transmitted wave and the incident one.

Question-4:
An EM wave are incident at oblique angle with a flat surface.
- i- Sketch a diagram for the incident, reflected and transmitted waves.
- ii- Describe the electric and magnetic fields through mathematical expressions.
- iii- Deduce the three main laws related to the phenomenon.
- iv- Derive the Fresnel equations for plane polarized light, and find the angle where there is no reflection.
- v- Use a computer code to *plot* the ratio between the reflected wave and the incident one, and similarly between the transmitted wave and the incident one.
- vi- Calculate transmission coefficient and Brewster's angle.

Question-5: Griffith Problem 9.15.

Question-6: Describe the phenomenon of EM wave reflection at conducting surfaces.

Question-7: Discuss in some detail the concept of wave guides.