UNIVERSITÀ DEGLI STUDI DI BRESCIA

Photonics Homework 2
May 12, 2022

Student ID:
Name:

Instructions: Please write your answer on a file or piece of paper and return it to me by uploading it in the Assignment Moodle section. I will look at all homework but will consider for evaluation only those retuned **not later than Friday May 19th**.
IMPORTANT: This homework is not mandatory so you will still be able to get your full score at the final test even if you can't do it or can't return it on time!

Questions:

1. What happens if we sum a right- and a left-handed circularly polarized wave of the same amplitude and propagation direction? Try to prove your answer by using both the real time expressions and the Jones vector representation of the fields.

2. A TE polarized plane wave illuminates the interface between air (n_a=1) and water (n_w=1.33) at θ_i= 60° from the air side.
    a. Calculate the angles of reflection and transmission, reflectance (R) and transmittance (T) values.
    b. Calculate the transmitted intensity I_t if the incident intensity is I_i = 2 MW/cm^2.
    c. What happens to the angles of reflection and transmission and values of R and T if the light impinges from the water side at the same angle? Motivate your answer.

3. Describe the concept of scattering and the parameters that govern this phenomenon.

4. Design a 1D photonic crystal whose normal-incidence photonic bandgap is maximized. Assume the materials composing the multilayer are glass (n_1=1.5) and silicon (n_2=3). Assume the periodicity a = 300nm. What is the central wavelength of the bandgap? Assuming the original multilayer is composed of N=5 periods, how can you modify the structure to obtain a defect state at the center of the band gap? (You can draw the original and modified stack for illustrative purposes).