FINAL

Upload Solutions to Ninova - Due Date: 6:00 AM – Saturday Morning – Jan 13 2017

1)

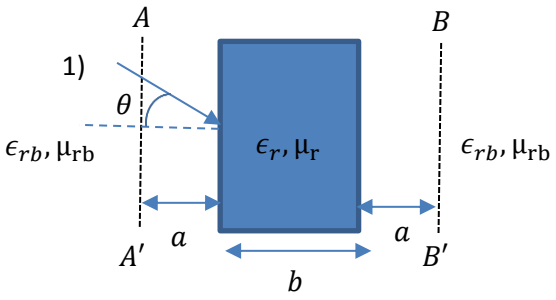

Figure 1

a) Derive the scattering matrix of the infinite slab given in the figure for both parallel and perpendicular polarization assuming that the reference planes are AA' and BB'. (The excitation frequency is $f = \frac{c}{\lambda}$ where c is the speed of the light in the vacuum. You can give your answer in terms of wavenumbers and impedances of mediums.)

b) Derive the ABCD matrix of the infinite slab given in the figure for both parallel and perpendicular polarization assuming that the reference planes are AA' and BB'. (The excitation frequency is $f = \frac{c}{\lambda}$ where c is the speed of the light in the vacuum. You can give your answer in terms of wavenumbers and impedances of mediums.)

c) If $\theta = 0$, $b = \frac{\lambda}{4\sqrt{\epsilon_r}}$, $a = \frac{\lambda}{4\sqrt{\epsilon_{rb}}}$ and $\mu_r = \mu_{rb} = 1$, what would be the S matrix and ABCD matrix of the periodic structure whose unit cell is the infinite slab given in Figure 1. Determine the stopbands and passbands of the infinitely long periodic structure. (Hint: Search "Fabry Perot filter" from Google.)

NOTE: Both scattering and ABCD parameters have to be calculated with respect to the component of the electric field, which is parallel to interface between the dielectric slab and the background !!!

2)

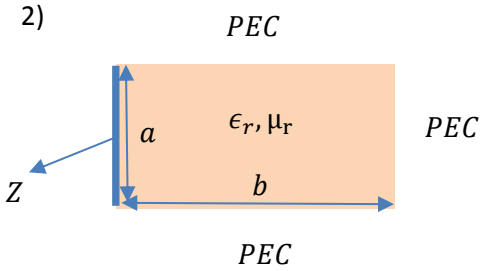

Figure 2

Derive the TE and TM modes for the waveguide given in Figure 2. Note that left side of the waveguide is ended with an impedance surface with impedance of Z.

3)

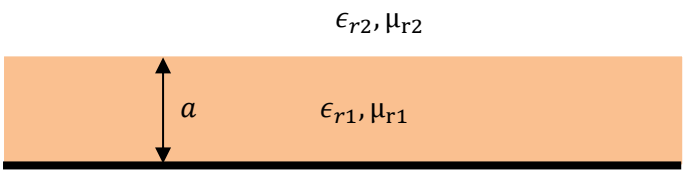

Figure 3

Derive the TE and TM modes for the grounded dielectric slab given in Figure 3. (Hint: You can search "Gorunded Dielectric Slab" from books, or from internet.)