Problem A5.43  (Credit: 20 Points) A four-layer medium has layer interfaces located at \( z_1 = 0, z_2 = 1, z_3 = 2 \text{ m} \). The permeability for all layers is \( \mu_0 \) and the dielectric constants are \( \epsilon_{r1} = \epsilon_{r4} = 1, \epsilon_{r2} = 4, \) and \( \epsilon_{r3} = 9 \) respectively. A parallelly polarized plane wave (\( f = 1 \text{ GHz} \)) is incident from layer 1 with incident wave amplitude \( H_0 = 1 \text{ V/m} \) and an angle of incidence \( \theta_i = 45^\circ \). Evaluate the following:

(a) Write a program (in Matlab or other language) to compute the global reflection coefficients, \( \tilde{R}_{i,i\pm1} \ (i = 1, 2, 3, 4) \) and the global transmission coefficient \( \tilde{T}_{14} \).

(b) Write the expression of the electric and magnetic fields in layers 1–4.

(c) Use a program to plot \( H_y \) within \( -1 \leq z \leq 3 \text{ m} \).

(d) Use a program to plot \( E_x \) and \( E_z \) within \( -1 \leq z \leq 3 \text{ m} \). (You should use the boundary conditions to judge whether your results make sense.)