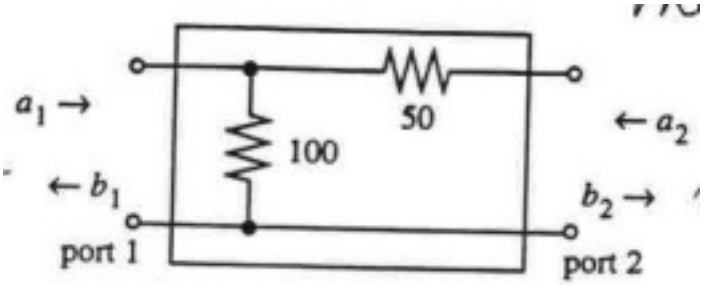
EECS 117A, Fall 1998
Midterm #2
Professor S.E. Schwarz

Problem #1 (40 points)



$$b_1 = S_{11}a_1 + S_{12}a_2$$
$$b_2 = S_{21}a_1 + S_{22}a_2$$

We want the four S-parameters for the block shown above. Use the notation shown. The reference impedance is 50 ohms.

(a) Find S_{11}

(b) Find S_{22}

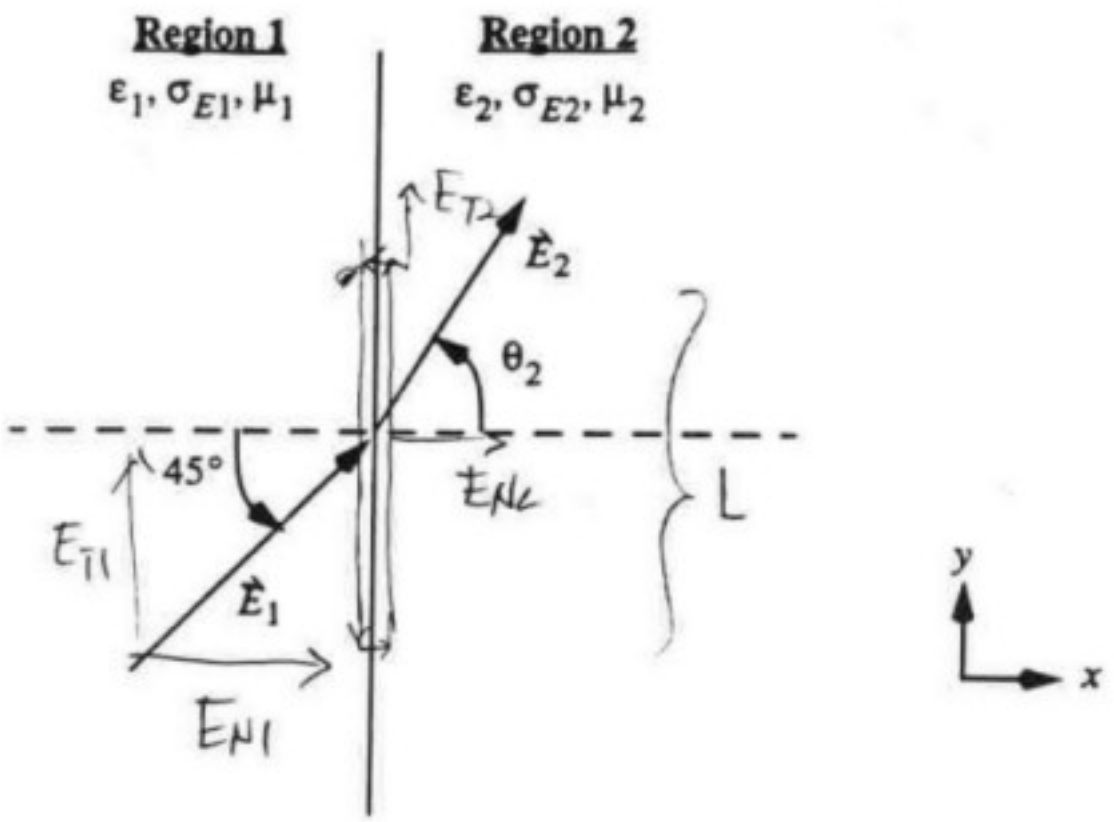
(c) Find S_{21}

(d) Find S_{12}

Problem #2 (30 points)

Consider a thin, rigid, spherical shell of material centered at the origin. The shell occupies the space between r = a and r = a+h, and you should assume h << a. The shell has a uniform charge density **rho**, and it rotates around the polar axis (or z-axis) with angular velocity **omega** radians/sec. Find the magnitude |**H**| of the magnetic field at the origin.
(If you happen to get an integral that you can't evaluate, just leave it in the form of an integral.)

Problem #3 (30 points)



The boundary between two electrically conductive materials lies in the x = 0 plane. Material 1 has **epsilon**$_1$,**sigma**$_{E1}$,**mu**$_1$ and material 2 has **epsilon**$_2$,**sigma**$_{E2}$,**mu**$_2$. Let **epsilon**$_2$ = 2**epsilon**$_1$, **sigma**$_{E2}$ = 3**sigma**$_{E1}$, **mu**$_2$ = 5**mu**$_1$. There is an electrostatic field E_1 in Region 1, which makes an angle of 45^o with the normal to the interface, as shown. Find **theta**$_2$, the angle between the electrostatic field and the normal on the right side of the boundary.

Answer: theta = _____ degrees
