p2-23 Repeat problem p2-15, but assume that $d_A = \lambda_A/8$ for part (c). Comment in a general way what advantages or disadvantages this design might have compared to choosing $d_A = \lambda_A/4$.

p4-14 For the transfer function (4.122), obtain expressions for the first three terms of the wavefront expansion (4.104) of the output due to an input unit step function. For the parameter values used in Figure 4.7, compute and plot on the same graph the response of the system to the rectangular input pulse (4.124) using (a) just the $i = 0$ term, (b) the $i = 0$ and $i = 1$ terms, and (c) the $i = 0, 1$ and 2 terms of (4.104). Comment on the accuracy of each of these approximations compared to the exact result, and to the two AWE results shown in Figure 4.7.

p5-28 Repeat problem p5-16, but for a waveguide whose cross-section is a $\frac{3}{4}$ sector of a circle as shown below.

Determine an expression for the cutoff wavenumber of the dominant TE mode, and compare it with that of the ordinary full-circle waveguide.
A one-sided CPW is obtained from the ordinary CPW by removing one of the ground planes as shown below.

This design eliminates the problem of maintaining both ground planes at the same potential (which requires air bridges), but is an unbalanced line (like the coaxial line) instead of a balanced line (like the two-wire line). An approximate formula for its capacitance per unit length has been found to be

$$C(\varepsilon_r) = 2\varepsilon_0 \left[ \frac{K(k')}{K(k)} + \frac{\varepsilon_r - 1}{2} \frac{K(k_1')}{K(k_1)} \right]$$

where

$$k = \sqrt{\frac{w}{s+w}}; \quad k_1 = e^{-\pi s/4h} \sqrt{\frac{\sinh \frac{\pi w}{2h}}{\sinh \frac{\pi (s+w)}{2h}}}$$

For $\varepsilon_r = 9.8$ and $(s + w)/h = 0.5$, compute and plot the characteristic impedance and effective dielectric constant of this line as a function of $w/s$ over the range $0.2 < \frac{w}{s} < 5$. Do you think a practical line of this type with $Z_c = 50 \, \Omega$ can be realized? Give your reasons.

A perfect magnetic conductor (PMC) is defined as a surface on which the total tangential magnetic field is equal to zero ($u_n \times H = 0$). Use the reciprocity theorem to prove that a surface-concentrated magnetic current density $M_S$ located at and tangential to a PMC surface $S$ produces zero field exterior to that surface.

Consider the transmission line of problem p9-24. Obtain a formula for the attenuation constant of the TEM mode of this structure. If both the wire and the earth are nonmagnetic, and good conductors, with $\sigma_{\text{wire}} = 10^5 \sigma_{\text{soil}}$, determine the value of $a/h$ for which the attenuation constant of this mode is minimum ($h$ remaining fixed). What is the characteristic impedance of the mode under this condition?

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