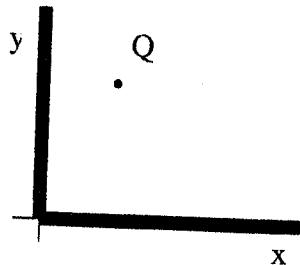1. (15%) For a positive point charge Q located at coordinate (d, 2d), with two grounded perpendicular conducting half-planes shown in the figure, find the potential and the electric field intensity at point A(2d, d), and also the electric field intensity at point B(-d, d).

2. What is a quarter-wave transformer?(10%)　As shown in the figure below, there are two antennas with 70Ω input impedance. Find the values of the characteristic impedances of both transmission line and quarter-wave transformer in order for Z_{in} to be 50Ω. (15%)
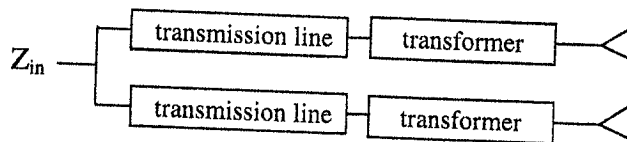
3. (20%) Assume that you are able to measure the time-average power along a transmission line. Design a measurement procedure by which you can estimate the attenuation constant of the line.

4. (20%) An electromagnetic wave from a media with perpendicular polarization is incident on the media-air interface at $\theta_i = 20^o$. Using $\varepsilon_r = 81$ and $\mu_r = 1$ for the media, find the critical angle θ_c, reflection coefficient $\Gamma_\perp$, transmission coefficient $\tau_\perp$, and the attenuation in dB for each half-wavelength into the air.

5. (20%) Here you want to feed the rectangular waveguide shown in the figure with a coaxial line. The center conductor of the coaxial line is inserted into the waveguide, and this feeding technique is regarded as "Probe Excitation." Where should you place the coaxial line? State your reasons.