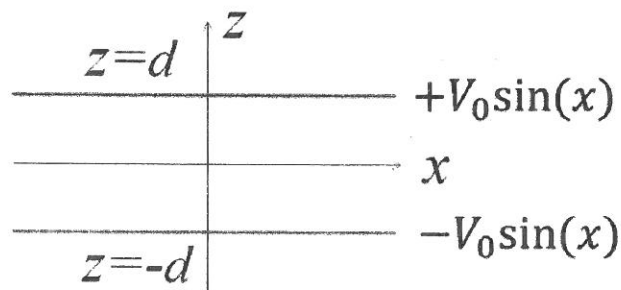
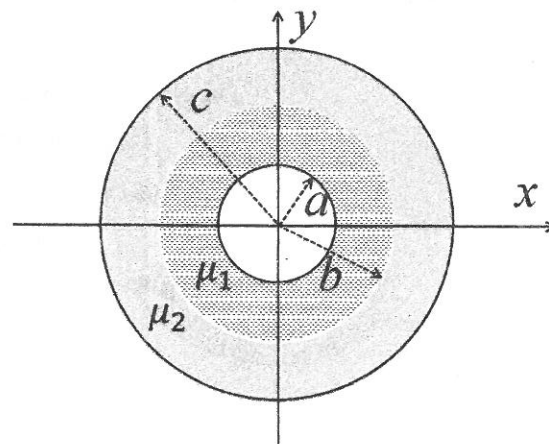


1. As illustrated in the figure below, two infinitely large parallel plates located at  $z = \pm d$  are maintained at the electrostatic potentials, respectively,  $\pm V_0 \sin(x)$ , where  $V_0$  is a constant.
  - (a) Find the electrostatic potential for the space regions  $|z| < d$  and  $|z| > d$ . (15%)
  - (b) Find the charge density on each of the parallel plates. (15%)



2. An infinitely long coaxial cable along the  $z$ -axis consists of two perfectly conducting cylindrical tubes with radii  $a$  and  $c$  that are connected with a wire at the far end of the cable. If two layers of uniform linear media with magnetic permeabilities  $\mu_1$  and  $\mu_2$  fill the space between the two tubes and a uniform current  $I$  is set up to flow along the inner tube towards the positive  $z$  direction and returns through the wire to the outer tube. Find the surface current density over the interface between the two linear media at radius  $b$  (see the figure below). (20%)



3. Explain the following terms briefly:

- (a) Fresnel formulas (5%)
- (b) Standing-wave ratio (SWR) (5%)
- (c) Energy-transport velocity (5%)
- (d) Radiation pattern of the antenna (5%)

4. Obtain a graph showing the relation between the attenuation constant  $\alpha$  and the operating frequency  $f$  for evanescent modes in a waveguide? (10%)

5. A parallel-polarized wave is incident from air into a dielectric medium with  $\epsilon_r=4$ .

- (a) Find the standing-wave ratio of a normal incidence condition (10%)
- (b) Find the Brewster angle for the complete transmission (10%)