PHYS 622 – HOMEWORK # 9 – DUE WEDNESDAY, 4/14/2010

Problem 1. Consider a perfectly conducting waveguide with circular cross section of radius a.

  a) Find the TE and TM propagating modes and their cutoff frequencies.

  b) The waveguide is turned into a coaxial cable by inserting a concentric conducting cylinder of radius b inside it. Compute the modes and their frequencies when the difference between the radii is smaller compared to the average radius.

  c) The waveguide of part a) is turned into a cavity of length L by putting two flat end faces. Determine the resonant frequencies of the cavity.

Problem 2. Consider an infinitesimally thin, perfectly conducting, waveguide with triangular cross section with sides of length a, a, and $a\sqrt{2}$.

  a) By analytically extending its mode functions, show that every triangular TM (TE) mode generates a TM (TE) mode of a square waveguide with sides of length a.

  b) Find the TM and TE modes of the triangular waveguide and their propagation frequencies.

Problem 3. Jackson problem 8.2 part (a).