ECE 6130 Impedance Matching

Text Sections: 5-2

Portfolio question: How do you design a single-stub matching network for "any" complex load?

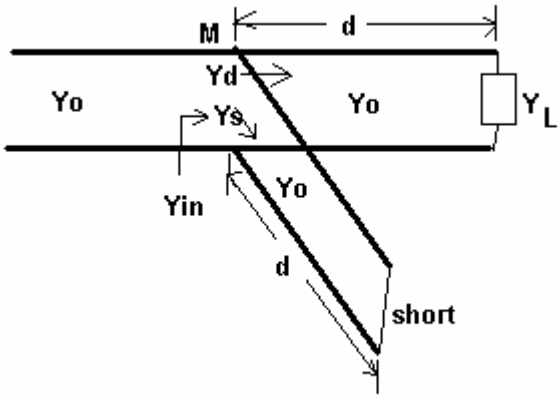
Examples: ECE315 text Chapter 2 (available on reserve in library or in the IEEE room)
Problems 35,36,38 (single stub matching)

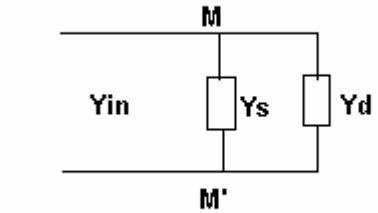
IMPEDANCE MATCHING:

A **matching network** is used so that there is no reflection from the load to the generator. (Zin (at input to matching network) = Zo)
One way to do this: Quarter-Wave Transformer
Disadvantage of 1/4 wave transformer? We must be able to adjust both L and Zo (size/shape of TL). This is not easy.

Better method: (Single Stub Matching) Use a known transmission line short or open-circuited at the end (a stub). Control the length of the stub and the distance to the load (both easy to control).

How to model stubs:





$Y_{in} = Y_s + Y_d$

EXAMPLE (See transparencies)

Matching:

For matched system, $Y_{in} = Y_o$
This is accomplished by: Adjusting the line length (d) until $Y_{in} = Y_o \pm jX$ and then adding in a capacitive / inductive component (short-circuited stub) to remove X.

Single-Stub Matching:
1) Plot z_L
2) Reflect it through the origin to find y_L
3) Rotate y_L towards the generator until it reaches $r_L = 1.0$ circle (there will be two points, choose the closest one). This is the length (d) between the load and the stub.
4) Read the value of x_L
5) For a short-circuited line, Plot z_L (left hand side), and reflect it through the origin to y_L (right hand side)
6) Rotate the short-circuit towards the generator until it reaches $y_s = 0 - j\, x_L$. This is the length of the stub.
7) The new $y_{in} = 1 + j0$ (bull's-eye)

EXAMPLE (see transparencies)