UNIVERSITY ☺F P☺RTLAND
Sch☺☺l ☺f Engineering

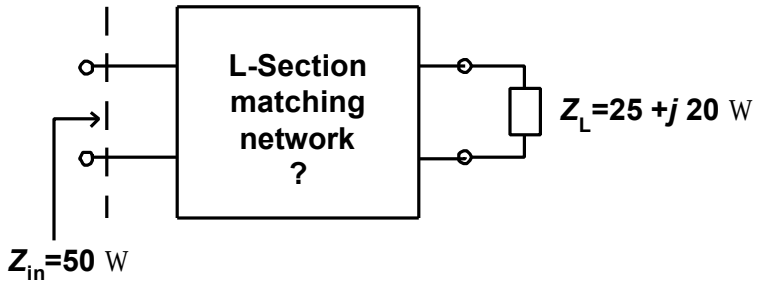
EE 301
Spring 2004
A.Inan

EE 301—Handout # 16
(Monday, March 29, 2004)

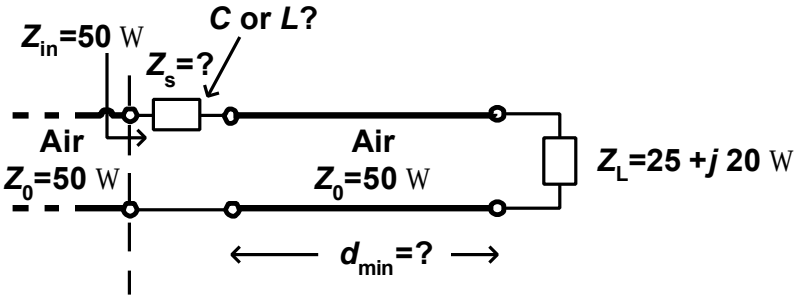
Homework # 6—Designing Matching Networks
(Due Wednesday, April 7, 2004, 11:25a.m.)

Use the Smith chart to solve each problem in this homework. Please show your work clearly on the Smith chart.

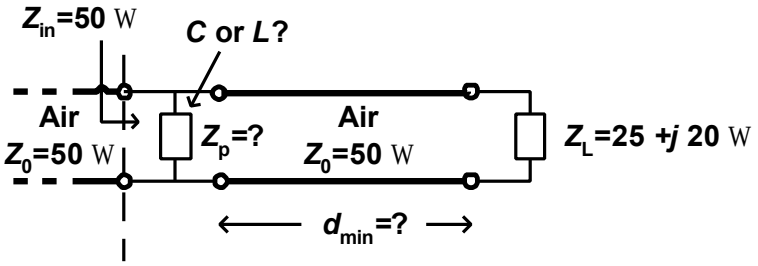
1. **L-section matching network.** Design two separate lumped L-section matching networks to match a load impedance of $Z_L = 25+j20\ \Omega$ to $Z_{in} = 50\ \Omega$ at 20 MHz. (Note that if you design more than two networks, you will get extra credit. Also, if a third L-section matching network is not possible to design for this problem and you justify this fact in your solution, then you will receive extra credit too.)



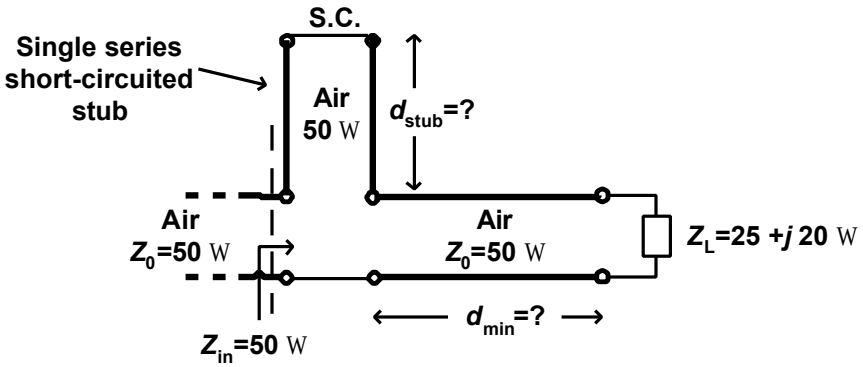
2. **Matching with a single series lumped reactive element on a transmission line.** Design the matching network shown to match a load impedance of value $Z_L = 25+j20\ \Omega$ to $Z_{in} = 50\ \Omega$ at 20 MHz. Connect the single series lumped reactive element as close as possible to the load. What is the type of this element, what should be its value and where should it be connected with respect to the load?



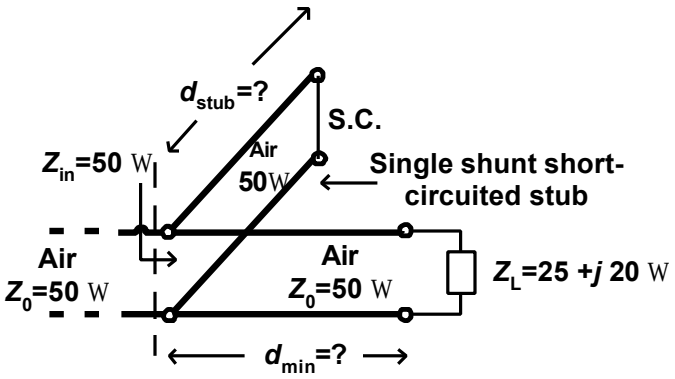
3. **Matching with a single shunt lumped reactive element on a transmission line.** Design the matching network shown to match a load impedance of value Z_L = 25+*j*20 Ω to Z_{in} =50 Ω at 20 MHz. Connect the single shunt lumped reactive element as close as possible to the load. What is the type of this element, what should be its value and where should it be connected with respect to the load?



4. **Matching with a single short-circuited series stub on a transmission line.** Design the matching network shown to match a load impedance of value Z_L = 25+*j*20 Ω to Z_{in} =50 Ω at 20 MHz. Connect the single short-circuited series stub as close as possible to the load. Determine the length and the location of the stub with respect to the load.



5. **Matching with a single short-circuited shunt stub on a transmission line.** Design the matching network shown to match a load impedance of value Z_L = 25+*j*20 Ω to Z_{in} =50 Ω at 20 MHz. Connect the single short-circuited shunt stub as close as possible to the load. Determine the length and the location of the stub with respect to the load.



6. **Quarter-wave transformer design.** Design the matching network shown to match a load impedance of value $Z_L = 25+j20\ \Omega$ to $Z_{in} = 50\ \Omega$ at 20 MHz. Connect the quarter-wave transformer as close as possible to the load. Determine the characteristic impedance, the length and the location of the quarter-wave transformer with respect to the load.