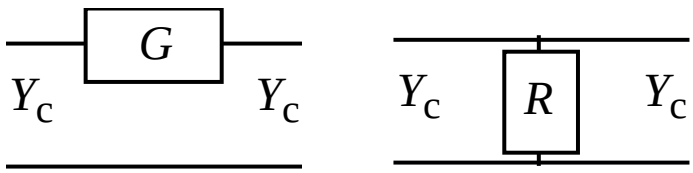
Microwaves

Series 8

Problem 1
We want to realize a T attenuator which is variable, matched to a 50Ω line and producing an attenuation between 3 and 10 dB. Determine the range of value of the variable resistors we will need to use

Problem 2
A switch is connected on a 50 Ω transmission line. When the switch is open, it can be represented as a 10'000 Ω resistor, when it is closed as a 1 Ω resistor. Find the scattering matrix for this open and closed switch, considering first that the switch is in series on the line and then that it is on parallel on the line (see figure) . Compare with the "ideal" case $R = 0$ and $R = \infty$.



Problem 3
We want to measure the attenuation of a reciprocal and symmetric two port device. To this aim, we terminate port two of the device with a short circuit, having a reflection coefficient $|\underline{\rho}|$ equal to 0,98 (the phase is not known).
At port one of the device, we measure then a VSWR of 3.5.
A second measurement is done, but this time with port two terminated by a perfect matched load ($\underline{\rho} = 0$), and we obtain a VSWR of 1.3 at port one of the device. What can we say about the attenuation of the device (s_{21}) ? What can we say about the error margins of the measurements ?

Problem 4
An inductive lossless iris is placed in a waveguide, producing an attenuation of 1.5 dB. An iris is a very thin obstacle placed transversally in the waveguide. Determine its normalized susceptance B/Yc (which will of course be inductive), the amplitude of the scattering parameters and the measured input VSWR. We suppose that the waveguide is terminated by a matched load.