1 ABCD Matrix method

In the figure below, two circuits are shown, (A) and (B).

For the circuit on the right \( z_0 \) is the characteristic impedance of the transmission line. Note that the line is terminated in its own characteristic impedance (i.e., \( z_0 \)).

Analyze these circuits as follows:

1. Use a “traditional” analysis (define the impedances, and use formulas for series \( [z = z_1 + z_2] \) and parallel \( z = \frac{z_1 z_2}{z_1 + z_2} \) combinations), to obtain the input impedance \( z_{in}(s) \), where \( s \) is the complex frequency \( (s = \sigma + j\omega) \), defined in the Laplace Transform. (10 mins)

2. Use the ABCD (Transmission) matrix approach to find the input impedance of the same two circuits. (15 mins)

3. For circuit (B), if the load impedance \( z_{load} \) is changed from \( z_0 \) to zero, describe the poles and zeros of the input impedance of the transmission line.

2 History

1. Describe some interesting things about Pythagoras. Be sure to include when, where, and why. What might this have to do with Audio Engineering?

2. Give a few reasons that Newton might be relevant to Audio Engineering.

3. What year did Fourier work out his analysis of heat transfer? How did he do it?