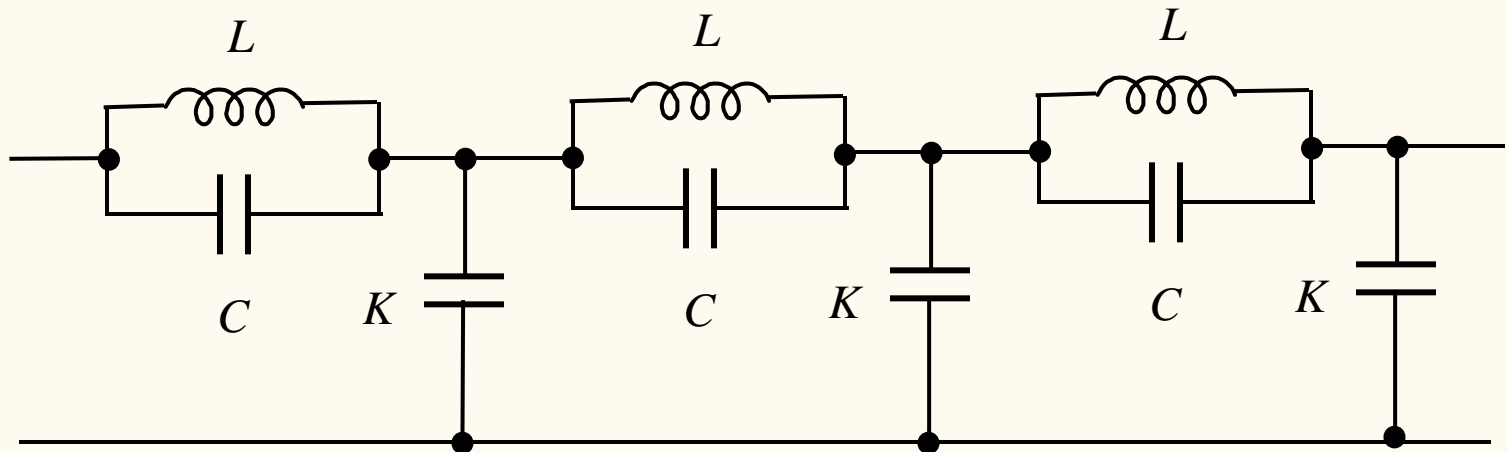
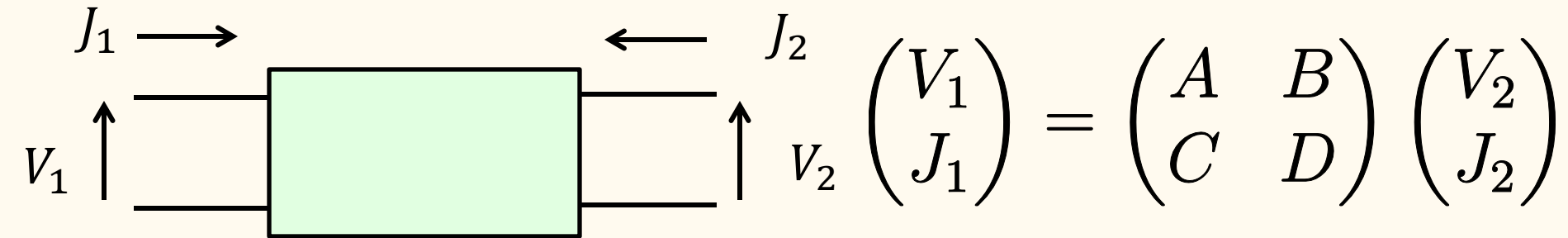


# Exercise 5-1

Obtain the dispersion relation in the following transmission line.

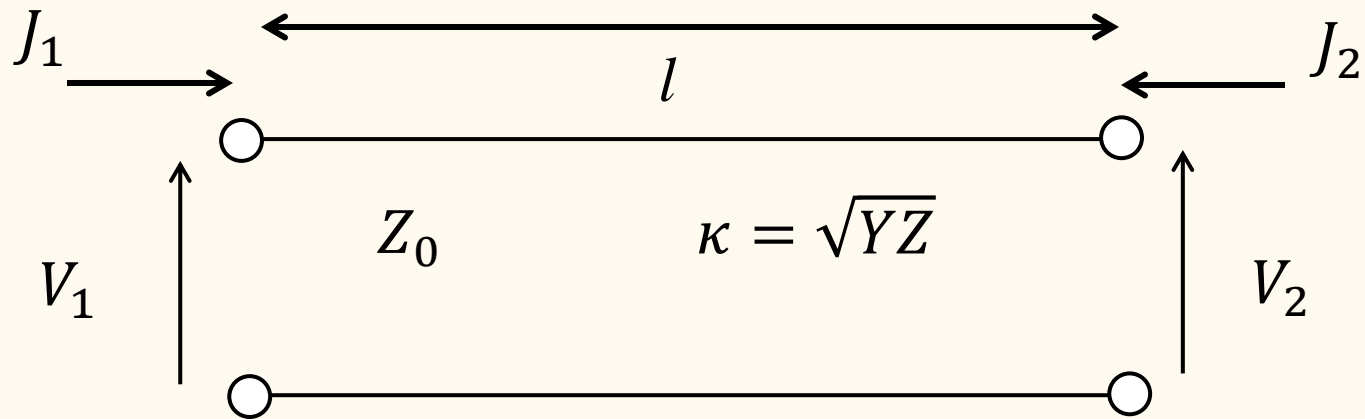


# Exercise 5-2



Remember F-matrix (cascade matrix) defined above.

Write down the F-matrix form of the transmission line shown below.



## Exercise 5-3

Show that the power spectrum  $G(f)$  of voltage noise across the impedance

$$Z(f) = R(f) + iY(f)$$

is given as

$$G(f) = 4R(f)k_{\text{B}}T.$$