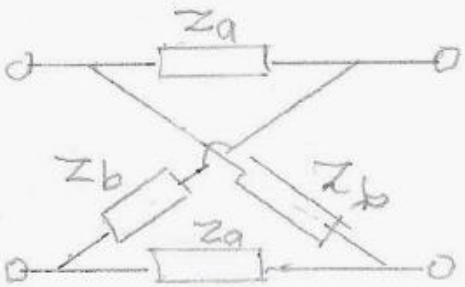
HOMEWORK 1

ECE 580, 2022

Solutions

1. Find the ABCD parameters of the symmetrical lattice shown.



Easy way: go through *z* parameters. By inspection,

$Z_{11} = Z_{22} = (Z_a + Z_b)/2$

$Z_{12} = Z_{21} = (Z_b - Z_a)/2$

From the Table on p. 42,

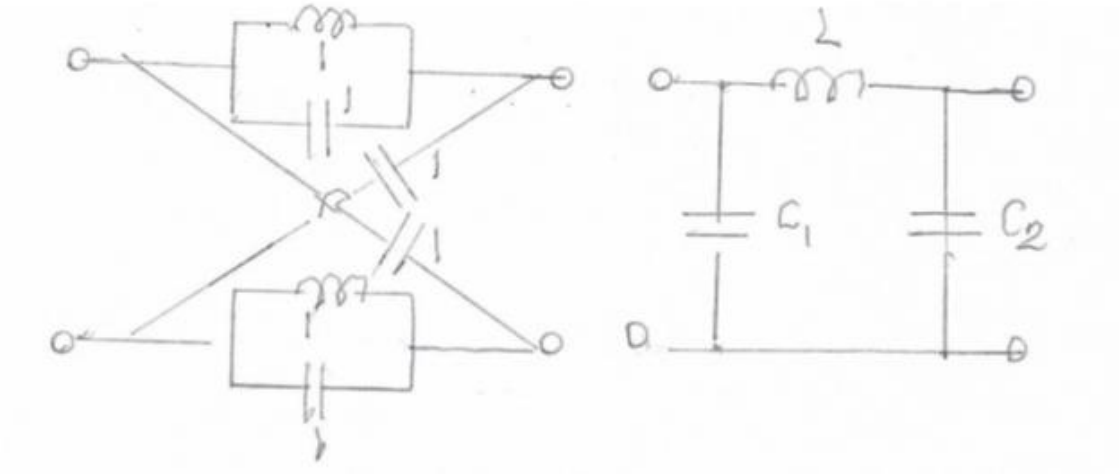
$A = D = Z_{11} / Z_{12} = (Z_a + Z_b)/(Z_b - Z_a)$

$B = |Z|/Z_{12} = 2\, Z_a\, Z_b/(Z_b - Z_a)$

$C = 1/Z_{12} = 2/(Z_b - Z_a)$

As a check, $A.D - B.C = 1$. Reciprocal two-port!

2. The two two-ports shown below are equivalent. Find the element values of the ladder circuit.



Using the equations of Problem 1,

$Z_{11} = Z_{22} = (Z_a + Z_b)/2 = (2s^2 + 1)/(2s^3 + 2s)$

$Z_{12} = Z_{21} = (Z_b - Z_a)/2 = 1/(2s^3 + 2s)$

For the ladder,

$Z_{11} = (LC_2s^2 + 1) / [\, LC_1C_2s^3 + (C_1+C_2)s]$

Equating coefficients of powers of *s* gives

$C_1 = C_2 = 1$

$L = 2$.