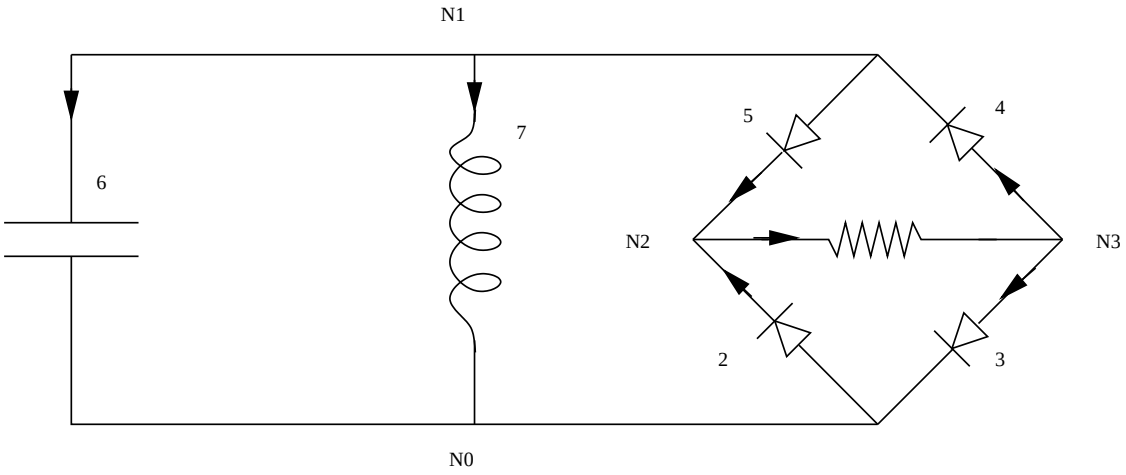
1 Diodes bridge



1.1 Unknowns

x = ${}^t(U_1, I_7)$, $Z_{ns} = {}^t\ (I_2, I_3, I_4, I_5)$, $Z_s = {}^t\ (V_2, V_3)$

1.2 Diode non smooth model instance

$$\beta = z_i = I_i$$
$$\alpha = U_i$$
$$z_i = 1l_i + 0\alpha$$
$$y_i = 1\alpha + 0l_i$$
$$0 \leq y_i \perp l_i \geq 0$$

1.3 Global formulation

$$\lambda = (l_1, l_2, l_3, l_4)$$
$$Z_{ns} = 0X + 0Z_s + Id\lambda$$
$$Y = \begin{pmatrix} 0 & 0 \\ 0 & 0 \\ 1 & 0 \\ 1 & 0 \end{pmatrix} x + \begin{pmatrix} 1 & 0 \\ 0 & 1 \\ 0 & -1 \\ -1 & 0 \end{pmatrix} Z_s + 0Z_{ns} + 0\lambda$$
$$0 \leq Y \perp \lambda \geq 0$$

1.4 Matrices formulation

$$\left(\begin{array}{c} x' = \begin{pmatrix} 0 & \frac{-1}{C} \\ \frac{1}{L} & 0 \end{pmatrix} x + \begin{pmatrix} 0 & \frac{-1}{C} \\ 0 & 0 \end{pmatrix} Z_s + \begin{pmatrix} 0 & 0 & \frac{1}{C} & \frac{-1}{C} \\ 0 & 0 & 0 & 0 \end{pmatrix} Z_{ns} \\ 0 = \begin{pmatrix} 0 & 0 \\ 0 & 0 \\ 0 & 1 \end{pmatrix} x + \begin{pmatrix} \frac{-1}{R} & \frac{1}{R} \\ \frac{-1}{R} & \frac{1}{R} \\ 1 & 0 \end{pmatrix} Z_s + \begin{pmatrix} 1 & 0 & 0 & 1 \\ 0 & +1 & 1 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix} Z_{ns} \\ Z_{ns} = Dx + 0Z_s + Id\lambda \\ Y = \begin{pmatrix} 0 & 0 \\ 0 & 0 \\ 1 & 0 \\ 1 & 0 \end{pmatrix} x + \begin{pmatrix} 1 & 0 \\ 0 & 1 \\ 0 & -1 \\ -1 & 0 \end{pmatrix} Z_s + 0Z_{ns} + 0\lambda \\ 0 \leq Y \perp \lambda \geq 0 \end{array}\right)$$

1.5 AN

C=0.01 F
L=1/120 H
R=33 ohm

$$\left(\begin{array}{c} x' = \begin{pmatrix} 0 & -100 \\ 120 & 0 \end{pmatrix} x + \begin{pmatrix} 0 & -100 \\ 0 & 0 \end{pmatrix} Z_s + \begin{pmatrix} 0 & 0 & -100 & -100 \\ 0 & 0 & 0 & 0 \end{pmatrix} Z_{ns} \\ 0 = \begin{pmatrix} 0 & 0 \\ 0 & 0 \\ 0 & 1 \end{pmatrix} x + \begin{pmatrix} -0.03 & 0.03 \\ -0.03 & 0.03 \\ 1 & 0 \end{pmatrix} Z_s + \begin{pmatrix} 1 & 0 & 0 & 1 \\ 0 & +1 & 1 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix} Z_{ns} \\ Z_{ns} = 0x + 0Z_s + Id\lambda \\ Y = \begin{pmatrix} 0 & 0 \\ 0 & 0 \\ 1 & 0 \\ 1 & 0 \end{pmatrix} x + \begin{pmatrix} 1 & 0 \\ 0 & 1 \\ 0 & -1 \\ -1 & 0 \end{pmatrix} Z_s + 0Z_{ns} + 0\lambda \\ 0 \leq Y \perp \lambda \geq 0 \end{array}\right)$$

ie

$$\left(\begin{array}{c} R = \begin{pmatrix} 0 & 0 & -100 & -100 \\ 0 & 0 & 0 & 0 \end{pmatrix} \lambda \\ x' = \begin{pmatrix} 0 & -100 \\ 120 & 0 \end{pmatrix} x + \begin{pmatrix} 0 & -100 \\ 0 & 0 \end{pmatrix} Z_s + R \\ 0 = \begin{pmatrix} 0 & 0 \\ 0 & 0 \\ 0 & 1 \end{pmatrix} x + \begin{pmatrix} -0.03 & 0.03 \\ -0.03 & 0.03 \\ 1 & 0 \end{pmatrix} Z_s + \begin{pmatrix} 1 & 0 & 0 & 1 \\ 0 & -1 & -1 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix} \lambda \\ Y = \begin{pmatrix} 0 & 0 \\ 0 & 0 \\ 1 & 0 \\ 1 & 0 \end{pmatrix} x + \begin{pmatrix} 1 & 0 \\ 0 & 1 \\ 0 & -1 \\ -1 & 0 \end{pmatrix} Z_s + 0\lambda \\ 0 \leq Y \perp \lambda \geq 0 \end{array}\right)$$