5. Hybrid Parameters (also called "h" parameters)

$$v_1 = h_{11} i_1 + h_{12} v_2$$
$$i_2 = h_{21} i_1 + h_{22} v_2$$

or, in matrix form, $\begin{bmatrix} v_1 \\ i_2 \end{bmatrix} = \begin{bmatrix} h_{11} & h_{12} \\ h_{21} & h_{22} \end{bmatrix} \begin{bmatrix} i_1 \\ v_2 \end{bmatrix}$

The hybrid parameters may be evaluated as follows:

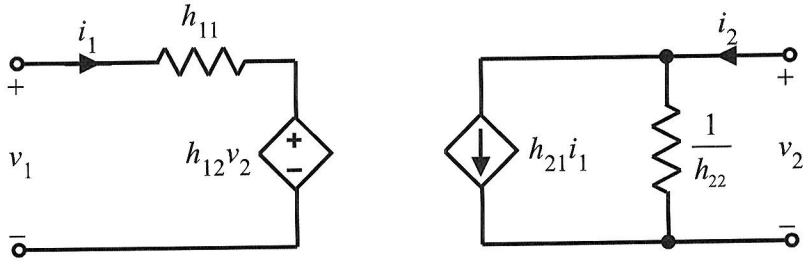
$$h_{11} = \left.\frac{v_1}{i_1}\right|_{v_2=0} = \left.\frac{v_1}{i_1}\right|_{v_2=0,\ i_1=1}$$

$$h_{12} = \left.\frac{v_1}{v_2}\right|_{i_1=0} = \left.\frac{v_1}{v_2}\right|_{i_1=0,\ v_2=1}$$

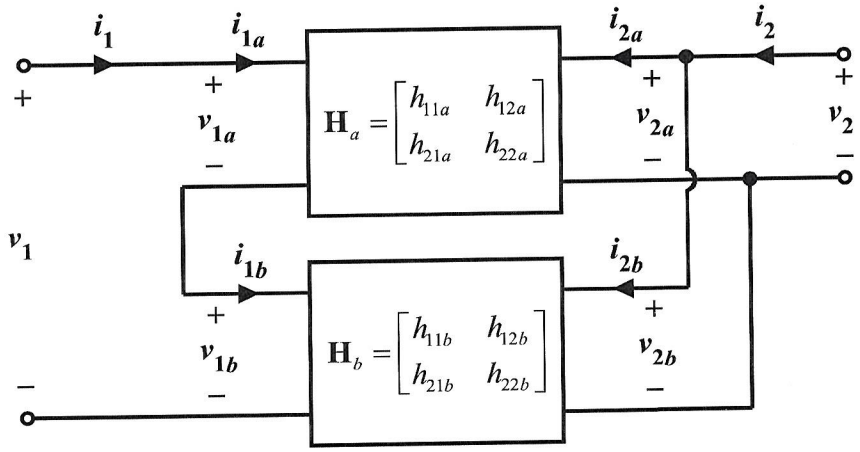
$$h_{21} = \left.\frac{i_2}{i_1}\right|_{v_2=0} = \left.\frac{i_2}{i_1}\right|_{v_2=0,\ i_1=1}$$

$$h_{22} = \left.\frac{i_2}{v_2}\right|_{i_1=0} = \left.\frac{i_2}{v_2}\right|_{i_1=0,\ v_2=1}$$

and the equivalent circuit is:



Hybrid parameters are useful for combining two two-port networks that are connected together in a **Series-Parallel** configuration. The hybrid parameters conveniently add together, as shown below:



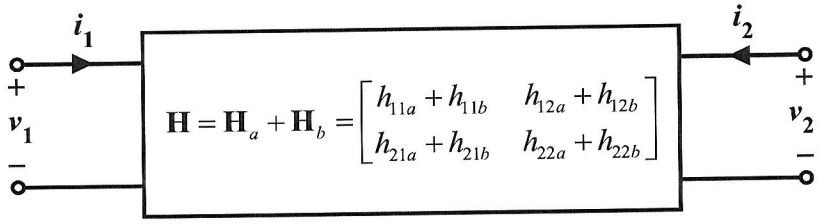
$$v_1 = v_{1a} + v_{1b}$$

$$i_1 = i_{1a} = i_{1b}$$

$$v_2 = v_{2a} = v_{2b}$$

$$i_2 = i_{2a} + i_{2b}$$

Therefore, $\begin{bmatrix} v_1 \\ i_2 \end{bmatrix} = \begin{bmatrix} v_{1a} + v_{1b} \\ i_{2a} + i_{2b} \end{bmatrix} = \begin{bmatrix} v_{1a} \\ i_{2a} \end{bmatrix} + \begin{bmatrix} v_{1b} \\ i_b \end{bmatrix} = \mathbf{H}_a \begin{bmatrix} i_{1a} \\ v_{2a} \end{bmatrix} + \mathbf{H}_b \begin{bmatrix} i_{1b} \\ v_{2b} \end{bmatrix} = \mathbf{H} \begin{bmatrix} i_1 \\ v_2 \end{bmatrix}$, where $\mathbf{H} = \mathbb{H}_a + \mathbf{H}_b$.



.06 μF missing?