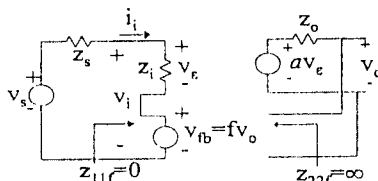**Row 1 — left (h parameters)**

$$V_1 = h_{11}I_1 + h_{12}V_2$$
$$I_2 = h_{21}I_1 + h_{22}V_2$$

$$h_{11} = \left.\frac{V_1}{I_1}\right|_{V_2=0} \qquad h_{12} = \left.\frac{V_1}{V_2}\right|_{I_1=0}$$
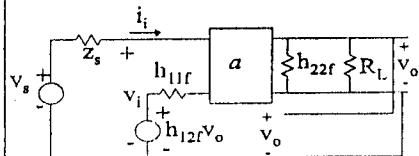
$$h_{21} = \left.\frac{I_2}{I_1}\right|_{V_2=0} \qquad h_{22} = \left.\frac{I_2}{V_2}\right|_{I_1=0}$$

Row 1 — middle: SERIE/PARALELO

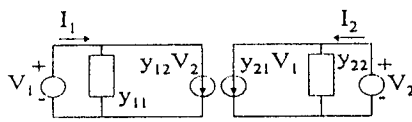$$A = \frac{v_o}{v_s} = \frac{a}{1+af} \qquad Z_i = \frac{v_s}{i_i} = z_i(1+af)$$
$$I_i = \frac{v_s}{z_i}\frac{1}{1+af} \qquad Z_o = \frac{z_o}{1+af}$$

Row 1 — right

$$|h_{12f}| >> |h_{12a}|$$
$$|h_{21f}| << |h_{21a}|$$

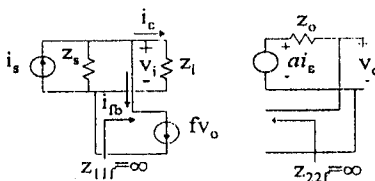Buen Amplificador de voltaje Zi ↑ Zo ↓

Row 2 — left (y parameters)

$$I_1 = y_{11}V_1 + y_{12}V_2$$
$$I_2 = y_{21}V_1 + y_{22}V_2$$

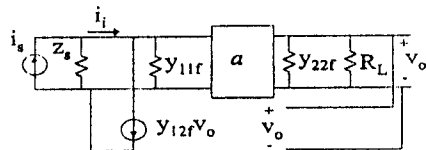$$y_{11} = \left.\frac{I_1}{V_1}\right|_{V_2=0} \qquad y_{12} = \left.\frac{I_1}{V_2}\right|_{V_1=0}$$

$$y_{21} = \left.\frac{I_2}{V_1}\right|_{V_2=0} \qquad y_{22} = \left.\frac{I_2}{V_2}\right|_{V_1=0}$$

Row 2 — middle: PARALELO/PARALELO

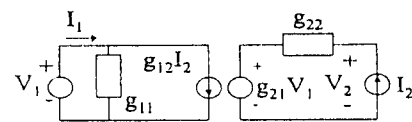$$A = \frac{v_o}{i_s} = \frac{a}{1+af} \qquad Z_i = \frac{v_i}{i_s} = \frac{z_i}{1+af}$$
$$a = \left.\frac{v_o}{i_s}\right|_{f=0} \qquad Z_o = \frac{z_o}{1+af}$$

Row 2 — right

$$|y_{12f}| >> |y_{12a}|$$
$$|y_{21f}| << |y_{21a}|$$

Buen Amplificador de trans-resistencia Zi ↓ Zo ↓
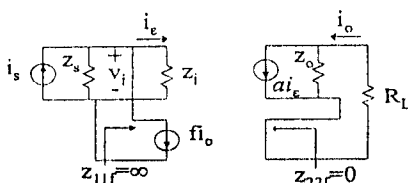

Row 3 — left (g parameters)

$$I_1 = g_{11}V_1 + g_{12}I_2$$
$$V_2 = g_{21}V_1 + g_{22}I_2$$

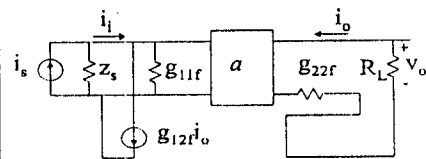$$g_{11} = \left.\frac{I_1}{V_1}\right|_{I_2=0} \qquad g_{12} = \left.\frac{I_1}{I_2}\right|_{V_1=0}$$

$$g_{21} = \left.\frac{V_2}{V_1}\right|_{I_2=0} \qquad g_{22} = \left.\frac{V_2}{I_2}\right|_{V_1=0}$$

Row 3 — middle: PARALELO/SERIE

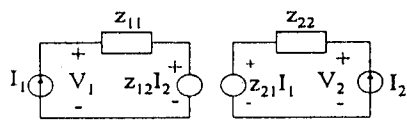$$A = \frac{i_o}{i_s} = \frac{a}{1+af} \qquad Z_i = \frac{v_i}{i_s} = \frac{z_i}{1+af}$$
$$Z_o = z_o(1+af)$$

Row 3 — right

$$|g_{12f}| >> |g_{12a}|$$
$$|g_{21f}| << |g_{21a}|$$

Buen Amplificador de trans-resistencia Zi ↓ Zo ↑
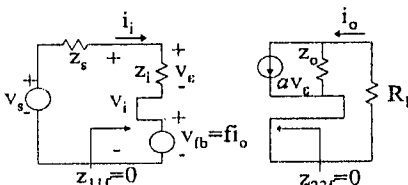

Row 4 — left (z parameters)

$$V_1 = z_{11}I_1 + z_{12}I_2$$
$$V_2 = z_{21}I_1 + z_{22}I_2$$

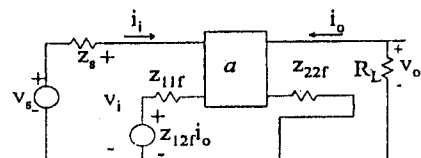$$z_{11} = \left.\frac{V_1}{I_1}\right|_{I_2=0} \qquad z_{12} = \left.\frac{V_1}{I_2}\right|_{I_1=0}$$

$$z_{21} = \left.\frac{V_2}{I_1}\right|_{I_2=0} \qquad z_{22} = \left.\frac{V_2}{I_2}\right|_{I_1=0}$$

Row 4 — middle: SERIE/SERIE

$$A = \frac{i_o}{v_s} = \frac{a}{1+af} \qquad Z_i = \frac{v_i}{i_i} = z_i(1+af)$$
$$Z_L << z_o \qquad Z_o = z_o(1+af)$$

Row 4 — right

$$|z_{12f}| >> |z_{12a}|$$
$$|z_{21f}| << |z_{21a}|$$

Buen Amplificador de trans-resistencia Zi ↑ Zo ↑