

**TABLA 20.1**

**TABLA DE CONVERSIÓN DE PARÁMETROS**

$$\begin{aligned}
 z_{11} &= \frac{y_{22}}{\Delta y} = \frac{a_{11}}{a_{21}} = \frac{b_{22}}{b_{21}} = \frac{\Delta h}{h_{22}} = \frac{1}{g_{11}} \\
 z_{12} &= -\frac{y_{12}}{\Delta y} = \frac{\Delta a}{a_{21}} = \frac{1}{b_{21}} = \frac{h_{12}}{h_{22}} = -\frac{g_{12}}{g_{11}} \\
 z_{21} &= -\frac{y_{21}}{\Delta y} = \frac{1}{a_{21}} = \frac{\Delta b}{b_{21}} = -\frac{h_{21}}{h_{22}} = \frac{g_{21}}{g_{11}} \\
 z_{22} &= \frac{y_{11}}{\Delta y} = \frac{a_{22}}{a_{21}} = \frac{b_{11}}{b_{21}} = \frac{1}{h_{22}} = \frac{\Delta g}{g_{11}} \\
 y_{11} &= \frac{z_{22}}{\Delta z} = \frac{a_{22}}{a_{12}} = \frac{b_{11}}{b_{12}} = \frac{1}{h_{11}} = \frac{\Delta g}{g_{22}} \\
 y_{12} &= -\frac{z_{12}}{\Delta z} = -\frac{\Delta a}{a_{12}} = -\frac{1}{b_{12}} = -\frac{h_{12}}{h_{11}} = \frac{g_{12}}{g_{22}} \\
 y_{21} &= -\frac{z_{21}}{\Delta z} = -\frac{1}{a_{12}} = -\frac{\Delta b}{b_{12}} = \frac{h_{21}}{h_{11}} = -\frac{g_{21}}{g_{22}} \\
 y_{22} &= \frac{z_{11}}{\Delta z} = \frac{a_{11}}{a_{12}} = \frac{b_{22}}{b_{12}} = \frac{\Delta h}{h_{11}} = \frac{1}{g_{22}} \\
 a_{11} &= \frac{z_{11}}{z_{21}} = -\frac{y_{22}}{y_{21}} = \frac{b_{22}}{\Delta b} = -\frac{\Delta h}{h_{21}} = \frac{1}{g_{21}} \\
 a_{12} &= \frac{\Delta z}{z_{21}} = -\frac{1}{y_{21}} = \frac{b_{12}}{\Delta b} = \frac{-h_{11}}{h_{21}} = \frac{g_{22}}{g_{21}} \\
 a_{21} &= \frac{1}{z_{21}} = -\frac{\Delta y}{y_{21}} = \frac{b_{21}}{\Delta b} = -\frac{h_{22}}{h_{21}} = \frac{g_{11}}{g_{21}} \\
 a_{22} &= \frac{z_{22}}{z_{21}} = -\frac{y_{11}}{y_{21}} = \frac{b_{11}}{\Delta b} = -\frac{1}{h_{21}} = \frac{\Delta g}{g_{21}} \\
 b_{11} &= \frac{z_{22}}{z_{12}} = -\frac{y_{11}}{y_{12}} = \frac{a_{22}}{\Delta a} = \frac{1}{h_{12}} = -\frac{\Delta g}{g_{12}} \\
 b_{12} &= \frac{\Delta z}{z_{12}} = -\frac{1}{y_{12}} = \frac{a_{12}}{\Delta a} = \frac{h_{11}}{h_{12}} = -\frac{g_{22}}{g_{12}}
 \end{aligned}$$

$$\begin{aligned}
 b_{21} &= \frac{1}{z_{12}} = -\frac{\Delta y}{y_{12}} = \frac{a_{21}}{\Delta a} = \frac{h_{22}}{h_{12}} = -\frac{g_{11}}{g_{12}} \\
 b_{22} &= \frac{z_{11}}{z_{12}} = \frac{y_{22}}{y_{12}} = \frac{a_{11}}{\Delta a} = \frac{\Delta h}{h_{12}} = -\frac{1}{g_{12}} \\
 h_{11} &= \frac{\Delta z}{z_{22}} = \frac{1}{y_{11}} = \frac{a_{12}}{a_{22}} = \frac{b_{12}}{b_{11}} = \frac{g_{22}}{\Delta g} \\
 h_{12} &= \frac{z_{12}}{z_{22}} = -\frac{y_{12}}{y_{11}} = \frac{\Delta a}{a_{22}} = \frac{1}{b_{11}} = -\frac{g_{12}}{\Delta g} \\
 h_{21} &= -\frac{z_{21}}{z_{22}} = \frac{y_{21}}{y_{11}} = -\frac{1}{a_{22}} = -\frac{\Delta b}{b_{11}} = -\frac{g_{21}}{\Delta g} \\
 h_{22} &= \frac{1}{z_{22}} = \frac{\Delta y}{y_{11}} = \frac{a_{21}}{a_{22}} = \frac{b_{21}}{b_{11}} = \frac{g_{11}}{\Delta g} \\
 g_{11} &= \frac{1}{z_{11}} = \frac{\Delta y}{y_{22}} = \frac{a_{21}}{a_{11}} = \frac{b_{21}}{b_{22}} = \frac{h_{22}}{\Delta h} \\
 g_{12} &= -\frac{z_{12}}{z_{11}} = \frac{y_{12}}{y_{22}} = -\frac{\Delta a}{a_{11}} = -\frac{1}{b_{22}} = -\frac{h_{12}}{\Delta h} \\
 g_{21} &= \frac{z_{21}}{z_{11}} = -\frac{y_{21}}{y_{22}} = \frac{1}{a_{11}} = \frac{\Delta b}{b_{22}} = -\frac{h_{21}}{\Delta h} \\
 g_{22} &= \frac{\Delta z}{z_{11}} = \frac{1}{y_{22}} = \frac{a_{12}}{a_{11}} = \frac{b_{12}}{b_{22}} = \frac{h_{11}}{\Delta h} \\
 \Delta z &= z_{11}z_{22} - z_{12}z_{21} \\
 \Delta y &= y_{11}y_{22} - y_{12}y_{21} \\
 \Delta a &= a_{11}a_{22} - a_{12}a_{21} \\
 \Delta b &= b_{11}b_{22} - b_{12}b_{21} \\
 \Delta h &= h_{11}h_{22} - h_{12}h_{21} \\
 \Delta g &= g_{11}g_{22} - g_{12}g_{21}
 \end{aligned}$$

**TABLA 20.2**
**ECUACIONES DE LAS REDES DE DOS PUERTAS CARGADAS**

| PARÁMETROS $z$                                                                    | PARÁMETROS $y$                                                                            |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| $Z_{in} = z_{11} - \frac{z_{12}z_{21}}{z_{22} + Z_L}$                             | $Y_{in} = y_{11} - \frac{y_{12}y_{21}Z_L}{1 + y_{22}Z_L}$                                 |
| $I_2 = \frac{-z_{21}V_g}{(z_{11} + Z_g)(z_{22} + Z_L) - z_{12}z_{21}}$            | $I_2 = \frac{y_{21}V_g}{1 + y_{22}Z_L + y_{11}Z_g + \Delta y Z_g Z_L}$                    |
| $V_{Th} = \frac{z_{21}}{z_{11} + Z_g} V_g$                                        | $V_{Th} = \frac{-y_{21}V_g}{y_{22} + \Delta y Z_g}$                                       |
| $Z_{Th} = z_{22} - \frac{z_{12}z_{21}}{z_{11} + Z_g}$                             | $Z_{Th} = \frac{1 + y_{11}Z_g}{y_{22} + \Delta y Z_g}$                                    |
| $\frac{I_2}{I_1} = \frac{-z_{21}}{z_{22} + Z_L}$                                  | $\frac{I_2}{I_1} = \frac{y_{21}}{y_{11} + \Delta y Z_L}$                                  |
| $\frac{V_2}{V_1} = \frac{z_{21}Z_L}{z_{11}Z_L + \Delta z}$                        | $\frac{V_2}{V_1} = \frac{-y_{21}Z_L}{1 + y_{22}Z_L}$                                      |
| $\frac{V_2}{V_g} = \frac{z_{21}Z_L}{(z_{11} + Z_g)(z_{22} + Z_L) - z_{12}z_{21}}$ | $\frac{V_2}{V_g} = \frac{y_{21}Z_L}{y_{12}y_{21}Z_gZ_L - (1 + y_{11}Z_g)(1 + y_{22}Z_L)}$ |
| PARÁMETROS $a$                                                                    | PARÁMETROS $b$                                                                            |
| $Z_{in} = \frac{a_{11}Z_L + a_{12}}{a_{21}Z_L + a_{22}}$                          | $Z_{in} = \frac{b_{22}Z_L + b_{12}}{b_{21}Z_L + b_{11}}$                                  |
| $I_2 = \frac{-V_g}{a_{11}Z_L + a_{12} + a_{21}Z_gZ_L + a_{22}Z_g}$                | $I_2 = \frac{-V_g\Delta b}{b_{11}Z_g + b_{21}Z_gZ_L + b_{22}Z_L + b_{12}}$                |
| $V_{Th} = \frac{V_g}{a_{11} + a_{21}Z_g}$                                         | $V_{Th} = \frac{V_g\Delta b}{b_{22} + b_{21}Z_g}$                                         |
| $Z_{Th} = \frac{a_{12} + a_{22}Z_g}{a_{11} + a_{21}Z_g}$                          | $Z_{Th} = \frac{b_{11}Z_g + b_{12}}{b_{21}Z_g + b_{22}}$                                  |
| $\frac{I_2}{I_1} = \frac{-1}{a_{21}Z_L + a_{22}}$                                 | $\frac{I_2}{I_1} = \frac{-\Delta b}{b_{11} + b_{21}Z_L}$                                  |
| $\frac{V_2}{V_1} = \frac{Z_L}{a_{11}Z_L + a_{12}}$                                | $\frac{V_2}{V_1} = \frac{\Delta b Z_L}{b_{12} + b_{22}Z_L}$                               |
| $\frac{V_2}{V_g} = \frac{Z_L}{(a_{11} + a_{21}Z_g)Z_L + a_{12} + a_{22}Z_g}$      | $\frac{V_2}{V_g} = \frac{\Delta b Z_L}{b_{12} + b_{11}Z_g + b_{22}Z_L + b_{21}Z_gZ_L}$    |

**TABLA 20.2 (continuación)**

| PARÁMETROS $h$                                                                         | PARÁMETROS $g$                                                                        |
|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| $Z_{in} = h_{11} - \frac{h_{12}h_{21}Z_L}{1 + h_{22}Z_L}$                              | $Y_{in} = g_{11} - \frac{g_{12}g_{21}}{g_{22} + Z_L}$                                 |
| $I_2 = \frac{h_{21}V_g}{(1 + h_{22}Z_L)(h_{11} + Z_g) - h_{12}h_{21}Z_L}$              | $I_2 = \frac{-g_{21}V_g}{(1 + g_{11}Z_g)(g_{22} + Z_L) - g_{12}g_{21}Z_g}$            |
| $V_{Th} = \frac{-h_{21}V_g}{h_{22}Z_g + \Delta h}$                                     | $V_{Th} = \frac{g_{21}V_g}{1 + g_{11}Z_g}$                                            |
| $Z_{Th} = \frac{Z_g + h_{11}}{h_{22}Z_g + \Delta h}$                                   | $Z_{Th} = g_{22} - \frac{g_{12}g_{21}Z_g}{1 + g_{11}Z_g}$                             |
| $\frac{I_2}{I_1} = \frac{h_{21}}{1 + h_{22}Z_L}$                                       | $\frac{I_2}{I_1} = \frac{-g_{21}}{g_{11}Z_L + \Delta g}$                              |
| $\frac{V_2}{V_1} = \frac{-h_{21}Z_L}{\Delta hZ_L + h_{11}}$                            | $\frac{V_2}{V_1} = \frac{g_{21}Z_L}{g_{22} + Z_L}$                                    |
| $\frac{V_2}{V_g} = \frac{-h_{21}Z_L}{(h_{11} + Z_g)(1 + h_{22}Z_L) - h_{12}h_{21}Z_L}$ | $\frac{V_2}{V_g} = \frac{g_{21}Z_L}{(1 + g_{11}Z_g)(g_{22} + Z_L) - g_{12}g_{21}Z_g}$ |

Fuente: Nilsson, James - Circuitos Eléctricos - 4ta ed.