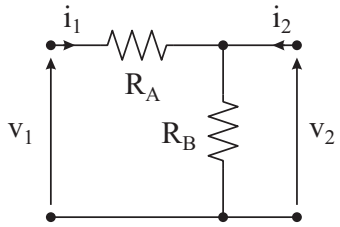
Esercizi di Elettrotecnica

Doppi bipoli resistivi

www.die.ing.unibo.it/pers/mastri/didattica.htm

(versione del 13-5-2008)

Esercizio n. 1



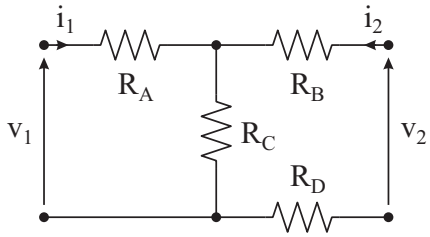
$R_A = 5\ \Omega$
$R_B = 10\ \Omega$

Determinare i coefficienti della matrice di resistenza e della matrice di conduttanza.

Risultati

$r_{11} = 15\ \Omega$	$r_{12} = r_{21} = 10\ \Omega$	$r_{22} = 10\ \Omega$
$g_{11} = 0.2$ S	$g_{12} = g_{21} = -0.2$ S	$g_{22} = 0.3$ S

Esercizio n. 2



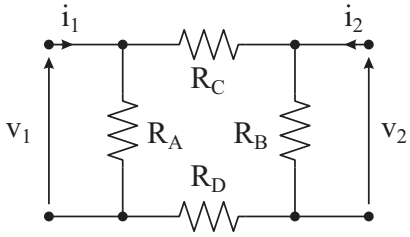
$R_A = 2\ \Omega$
$R_B = 2\ \Omega$
$R_C = 2\ \Omega$
$R_D = 2\ \Omega$

Determinare i coefficienti della matrice di resistenza e della matrice di conduttanza.

Risultati

$r_{11} = 4\ \Omega$	$r_{12} = r_{21} = 2\ \Omega$	$r_{22} = 6\ \Omega$
$g_{11} = 0.3$ S	$g_{12} = g_{21} = -0.1$ S	$g_{22} = 0.2$ S

Esercizio n. 3



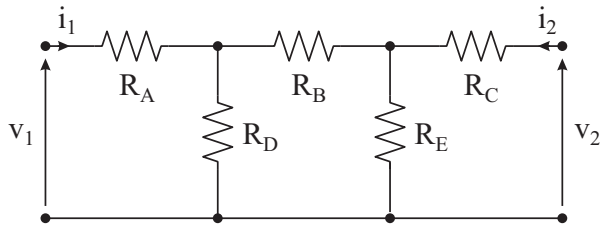
$R_A = 5\ \Omega$
$R_B = 10\ \Omega$
$R_C = 4\ \Omega$
$R_D = 6\ \Omega$

Determinare i coefficienti della matrice di resistenza e della matrice di conduttanza.

Risultati

$r_{11} = 4\ \Omega$	$r_{12} = r_{21} = 2\ \Omega$	$r_{22} = 6\ \Omega$
$g_{11} = 0.3$ S	$g_{12} = g_{21} = -0.1$ S	$g_{22} = 0.2$ S

Esercizio n. 4



$R_A = 30\ \Omega$
$R_B = 30\ \Omega$
$R_C = 30\ \Omega$
$R_D = 30\ \Omega$
$R_E = 30\ \Omega$

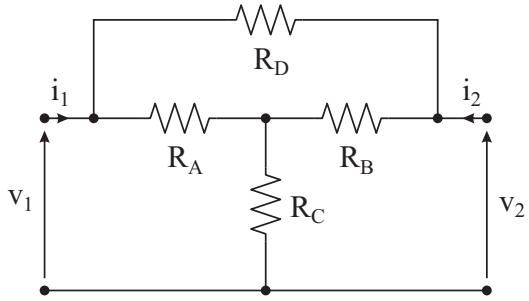
Determinare i coefficienti della matrice di resistenza e della matrice ibrida.

Risultati

$r_{11} = r_{22} = 50\ \Omega$ $r_{12} = r_{21} = 10\ \Omega$

$h_{11} = 48\ \Omega$ $h_{12} = 0.2$ $h_{21} = -0.2$ $h_{22} = 0.02\ S$

Esercizio n. 5



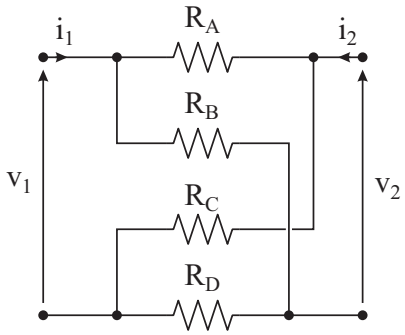
$R_A = 4\ \Omega$
$R_B = 4\ \Omega$
$R_C = 3\ \Omega$
$R_D = 8\ \Omega$

Determinare i coefficienti della matrice di resistenza.

Risultati

$r_{11} = r_{22} = 6\ \Omega$ $r_{12} = r_{21} = 4\ \Omega$

Esercizio n. 6



$R_A = 20\ \Omega$
$R_B = 30\ \Omega$
$R_C = 40\ \Omega$
$R_D = 10\ \Omega$

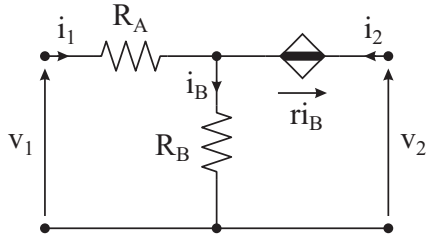
Determinare i coefficienti della matrice di resistenza.

Risultati

$r_{11} = 24\ \Omega$ $r_{12} = r_{21} = 10\ \Omega$ $r_{22} = 25\ \Omega$

$h_{11} = 20\ \Omega$ $h_{12} = 0.4$ $h_{21} = -0.4$ $h_{22} = 0.04\ S$

Esercizio n. 7



$R_A = 4\ \Omega$
$R_B = 2\ \Omega$
$r = 3\ \Omega$

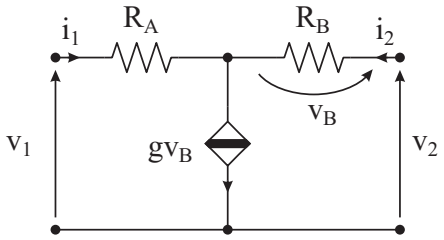
Determinare i coefficienti della matrice di resistenza e della matrice ibrida.

Risultati

$r_{11} = 6\ \Omega$ $r_{12} = 2\ \Omega$ $r_{21} = 5\ \Omega$ $r_{22} = 5\ \Omega$

$h_{11} = 4\ \Omega$ $h_{12} = 0.4$ $h_{21} = -1$ $h_{22} = 0.2\ S$

Esercizio n. 8



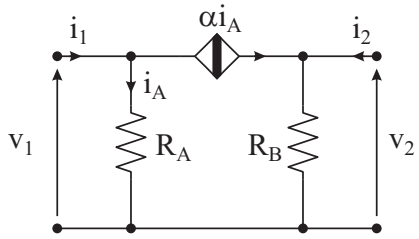
$R_A = 2\Omega$
$R_B = 6\ \Omega$
$g = 0.25$ S

Determinare i coefficienti della matrice di conduttanza e della matrice ibrida.

Risultati

$g_{11} = -0.1$ S	$g_{12} = 0.1$ S	$g_{21} = -0.2$ S	$g_{22} = 0.2$ S
$h_{11} = -10\ \Omega$	$h_{12} = 1$	$h_{21} = 2$	$h_{22} = 0$ S

Esercizio n. 9



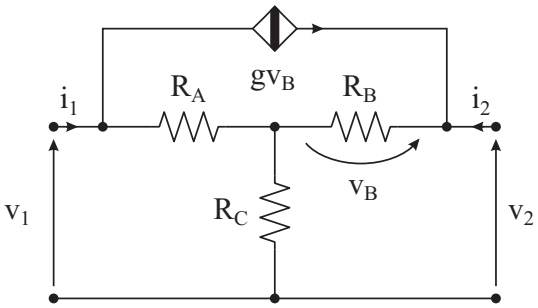
$R_A = 10\Omega$
$R_B = 5\ \Omega$
$\alpha = 4$

Determinare i coefficienti della matrice di resistenza e della matrice ibrida.

Risultati

$r_{11} = 5\ \Omega$	$r_{12} = 0\ \Omega$	$r_{21} = 4\ \Omega$	$r_{22} = 5\ \Omega$
$h_{11} = 5\ \Omega$	$h_{12} = 0$	$h_{21} = -0.8$	$h_{22} = 0.2$ S

Esercizio n. 10



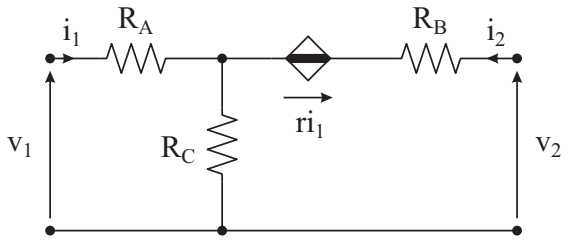
$R_A = R_B = R_C = R$

Determinare i coefficienti della matrice di conduttanza e della matrice ibrida.

Risultati

$g_{11} = (2-gR)/(3R)$ S	$g_{12} = (2gR-1)/(3R)$ S	$g_{21} = (gR-1)/(3R)$ S	$g_{22} = (2+gR)/(3R)$ S
$h_{11} = 3R/(2-gR)\ \Omega$	$h_{12} = (1-2gR)/(2-gR)$	$h_{21} = (1-gR)/(gR-2)$	$h_{22} = (1-2gR)/(R(2-gR))$ S

Esercizio n. 11



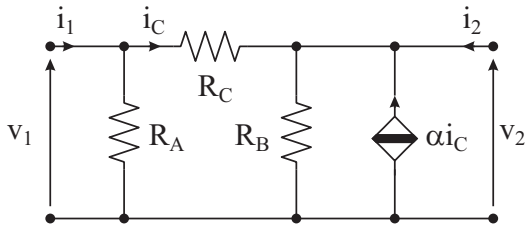
$R_A = 4\ \Omega$
$R_B = 2\ \Omega$
$R_C = 2\ \Omega$
$r = 4\ \Omega$

Determinare i coefficienti della matrice di resistenza e della matrice ibrida.

Risultati

$r_{11} = 6\ \Omega$	$r_{12} = 2\ \Omega$	$r_{21} = 6\ \Omega$	$r_{22} = 4\ \Omega$
$h_{11} = 3\ \Omega$	$h_{12} = 0.5$	$h_{21} = -1.5$	$h_{22} = 0.25$ S

Esercizio n. 12



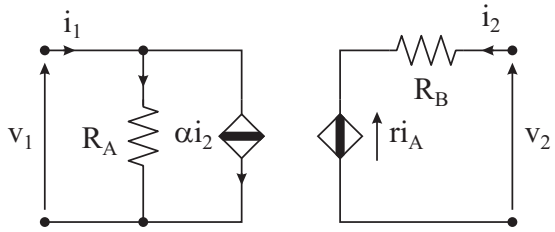
$R_A = R_B = R_C = R$

Determinare i coefficienti della matrice di conduttanza e della matrice ibrida.

Risultati

$g_{11} = 2/R$ S	$g_{12} = -1/R$ S	$g_{21} = -(1+\alpha)/R$ S	$g_{22} = (2+\alpha)/R$ S
$h_{11} = R/2\ \Omega$	$h_{12} = 1/2$	$h_{21} = -(1+\alpha)/2$	$h_{22} = (3+\alpha)/(2R)$ S

Esercizio n. 13



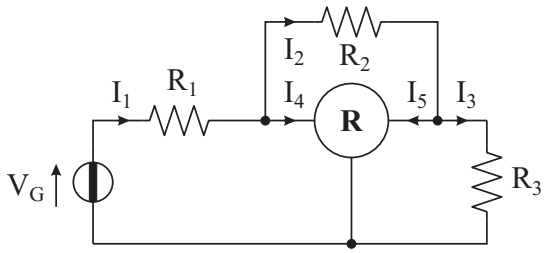
$R_A = 2\ \Omega$
$R_B = 4\ \Omega$
$r = 4\ \Omega$
$\alpha = 0.5$

Determinare i coefficienti della matrice di conduttanza e della matrice ibrida.

Risultati

$g_{11} = 0.25$ S	$g_{12} = 0.125$ S	$g_{21} = -0.5$ S	$g_{22} = 0.25$ S
$h_{11} = 4\ \Omega$	$h_{12} = -0.5$	$h_{21} = -2$	$h_{22} = 0.5$ S

Esercizio n. 14

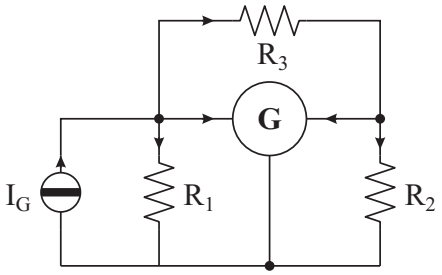


$R_1 = 5\ \Omega$
$R_2 = 4\ \Omega$
$R_3 = 2\ \Omega$
$\mathbf{R} = \begin{bmatrix} 32 & 3 \\ 20 & 2 \end{bmatrix}$ (Ω)
$V_G = 35$ V

Determinare le correnti indicate.

Risultati
$I_1 = 3$ A $I_2 = 2$ A $I_3 = 6$ A $I_4 = 1$ A $I_5 = -4$ A

Esercizio n. 15

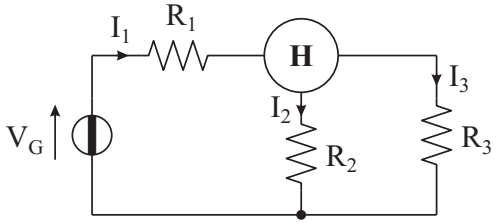


$R_1 = 40\ \Omega$
$R_2 = 5\ \Omega$
$R_3 = 10\ \Omega$
$\mathbf{G} = \begin{bmatrix} 0.1 & 0.2 \\ -0.5 & 0.1 \end{bmatrix}$ (S)
$I_G = 3$ A

Determinare le tensioni dei resistori.

Risultati
$V_1 = 8$ V $V_2 = 12$ V $V_3 = -4$ V

Esercizio n. 16

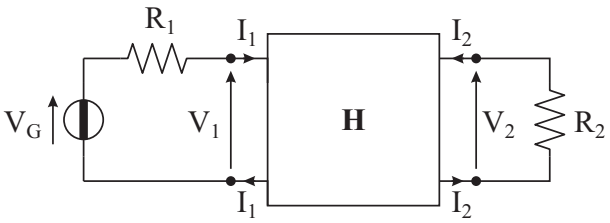


$R_1 = 10\ \Omega$
$R_2 = 5\ \Omega$
$R_3 = 5\ \Omega$
$\mathbf{H} = \begin{bmatrix} 5 & 0 \\ -12.5 & 0.5 \end{bmatrix}$
$V_G = 15$ V

Determinare le correnti dei resistori.

Risultati
$I_1 = 2$ A $I_2 = -3$ A $I_3 = 5$ A

Esercizio n. 17

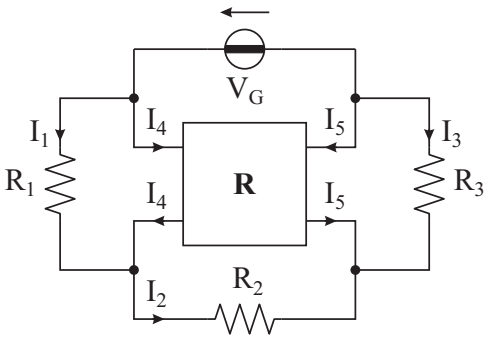


$R_1 = 6\ \Omega$
$R_2 = 4\ \Omega$
$\mathbf{H} = \begin{bmatrix} 6 & -0.5 \\ -6 & 0.125 \end{bmatrix}$
$V_G = 4$ V

Determinare le tensioni V_1 e V_2.

Risultati
$V_1 = -2$ V $V_2 = 16$ V

Esercizio n. 18

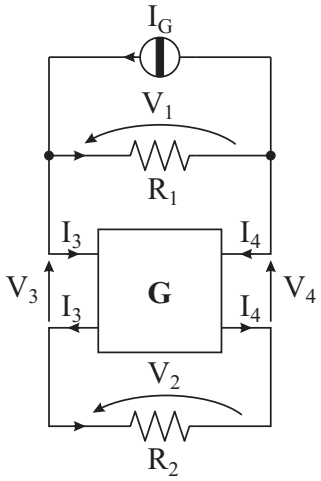


$R_1 = 5\ \Omega$
$R_2 = 5\ \Omega$
$R_3 = 5\ \Omega$
$\mathbf{R} = \begin{bmatrix} 5 & 3 \\ 5 & 10 \end{bmatrix}$ (Ω)
$V_G = 80$ V

Determinare le correnti indicate.

Risultati
$I_1 = 3$ A $I_2 = 9$ A $I_3 = -4$ A $I_4 = 6$ A $I_5 = -5$ A

Esercizio n. 19

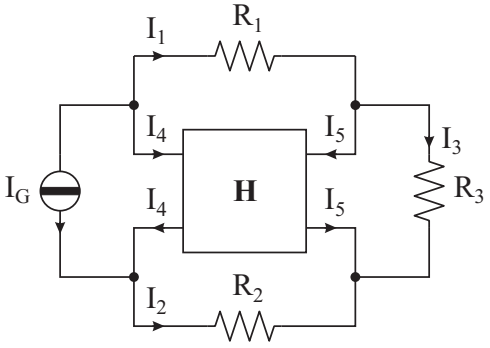


$R_1 = 6\ \Omega$
$R_2 = 4\ \Omega$
$\mathbf{G} = \begin{bmatrix} 0.5 & 0.25 \\ -1.5 & 0.25 \end{bmatrix}$ (S)
$I_G = 6$ A

Determinare le tensioni indicate.

Risultati
$V_1 = 12$ V $V_2 = 16$ V $V_3 = 4$ V $V_4 = 8$ V

Esercizio n. 20



$R_1 = 2\ \Omega$
$R_2 = 5\ \Omega$
$R_2 = 12\Omega$
$\mathbf{H} = \begin{bmatrix} 3 & 0 \\ -8 & 0.125 \end{bmatrix}$
$I_G = 2$ A

Determinare le correnti indicate.

Risultati
$I_1 = -3$ A $I_2 = 3$ A $I_3 = 2$ A $I_4 = 1$ A $I_5 = -5$ A