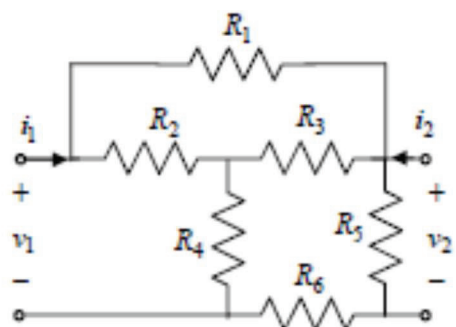


**ES. 5.4** - Con riferimento al seguente doppio-bipolo:

a) caratterizzarlo attraverso la matrice  $R$ ;



$$R_1 = R_2 = R_3 = R_4 = R$$

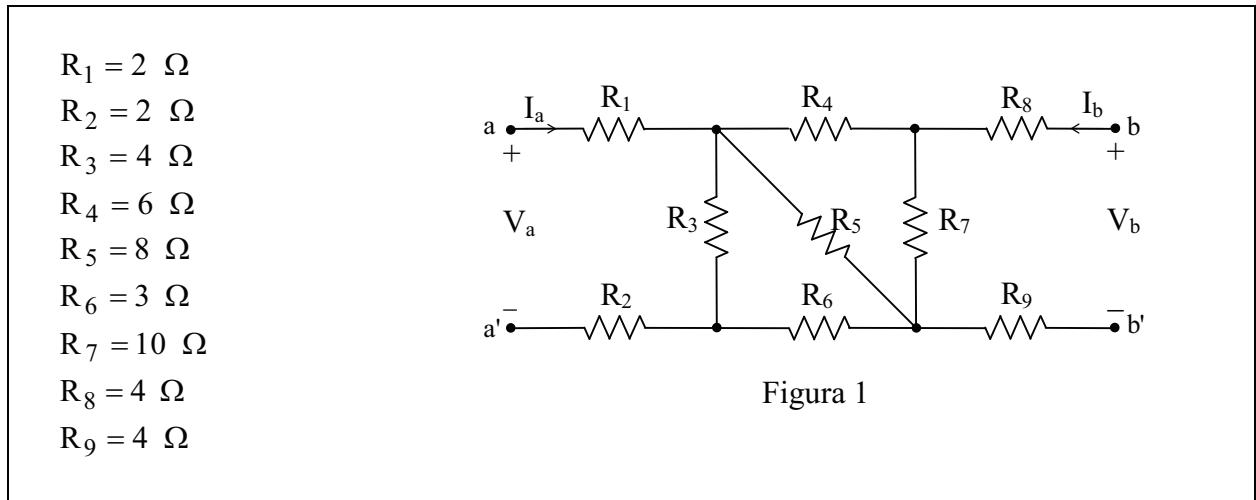
$$R_5 = \frac{2}{3}R \quad R_6 = \frac{1}{3}R$$

$$R = 24 \Omega$$

Risultato: a)  $R_{11} = 24 \Omega$ ,  $R_{22} = 12 \Omega$ ,  $R_m = 8 \Omega$

### Esercizio 4.6

Determinare le matrici delle conduttanze e di trasmissione del doppio bipolo di fig. 1.



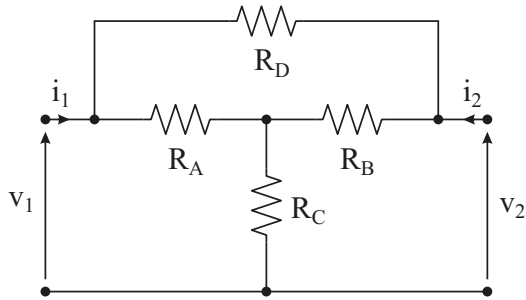
$$\left\langle [G] = \begin{bmatrix} 0.15123 & -0.012642 \\ -0.012642 & 0.078382 \end{bmatrix} S; [T] = \begin{bmatrix} 6.2 & 79.1 \ \Omega \\ 0.925 \ S & 11.9625 \end{bmatrix} \right\rangle$$

**Risultati**

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

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


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**Esercizio n. 5**

$$R_A = 4 \, \Omega$$

$$R_B = 4 \, \Omega$$

$$R_C = 3 \, \Omega$$

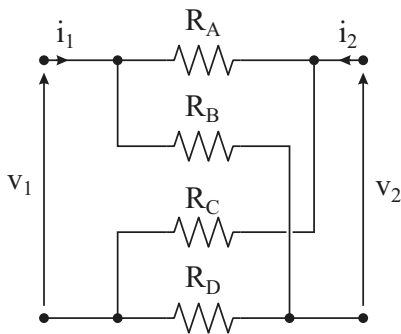
$$R_D = 8 \, \Omega$$

Determinare i coefficienti della matrice di resistenza.

**Risultati**

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


---

**Esercizio n. 6**

$$R_A = 20 \, \Omega$$

$$R_B = 30 \, \Omega$$

$$R_C = 40 \, \Omega$$

$$R_D = 10 \, \Omega$$

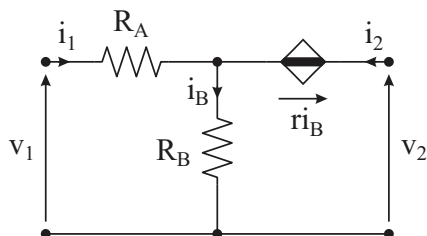
Determinare i coefficienti della matrice di resistenza.

**Risultati**

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

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


---

**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.

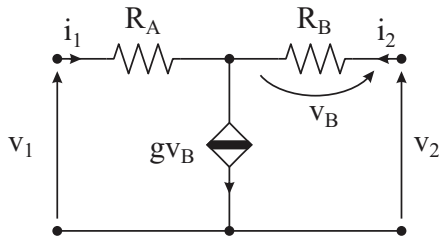
**Risultati**

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

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


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**Esercizio n. 8**



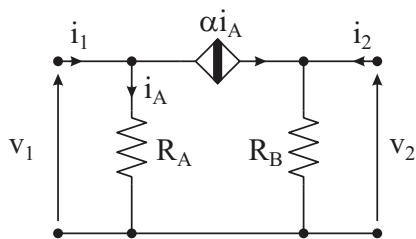
$$\begin{aligned} R_A &= 2\Omega \\ R_B &= 6\Omega \\ g &= 0.25\text{ S} \end{aligned}$$

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

**Risultati**

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

**Esercizio n. 9**



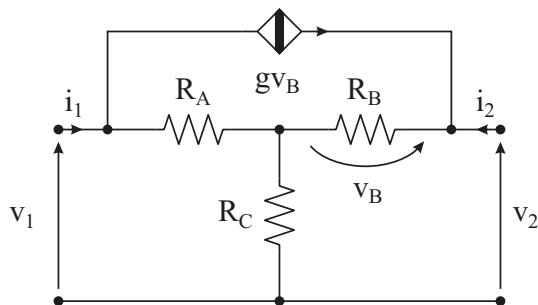
$$\begin{aligned} R_A &= 10\Omega \\ R_B &= 5\Omega \\ \alpha &= 4 \end{aligned}$$

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

**Risultati**

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

**Esercizio n. 10**



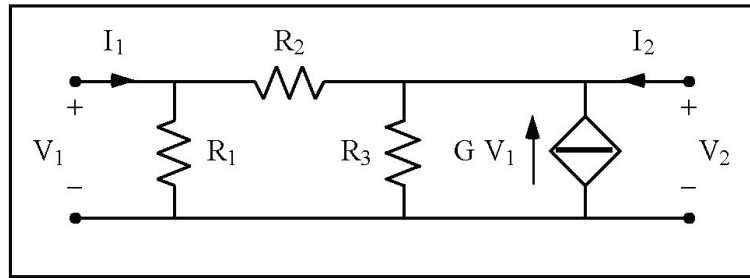
$$R_A = R_B = R_C = R$$

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

**Risultati**

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

**S39** - Determinare la rappresentazione ibrida del doppio bipolo mostrato in figura.



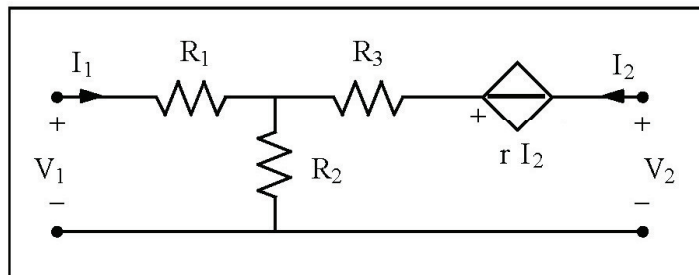
Risposta:

$$h_{11} = \frac{R_1 R_2}{R_1 + R_2}, \quad h_{12} = \frac{R_1}{R_1 + R_2},$$

$$h_{21} = -\frac{R_1 (1 + G R_2)}{R_1 + R_2}, \quad h_{22} = \frac{1}{R_3} + \frac{1}{R_1 + R_2} - \frac{G R_1}{R_1 + R_2}.$$

Discutete il caso particolare  $G = 0$  A/V.

**S40** - Determinare la rappresentazione ibrida 'h' che descrive il doppio bipolo. Discutere il caso particolare  $r = 0$  V/A.

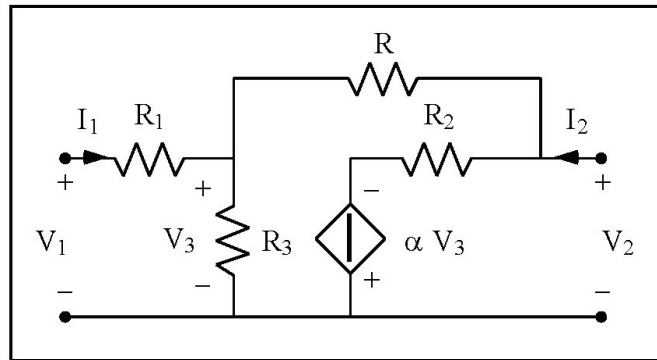


Risposta:

$$h_{11} = R_1 + \frac{R_2 (r - R_3)}{r - R_2 - R_3}, \quad h_{12} = \frac{R_2}{R_2 + R_3 - r},$$

$$h_{21} = \frac{R_2}{r - R_2 - R_3}, \quad h_{22} = \frac{1}{R_2 + R_3 - r}.$$

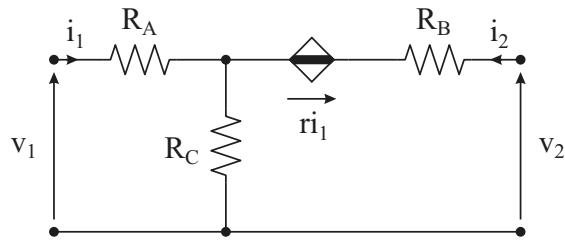
S41 - Calcolare la rappresentazione ibrida 'g' che descrive il doppio bipolo.



Dati:  $R_1 = 5 \Omega$ ,  $R_2 = 50 \Omega$ ,  $R_3 = 25 \Omega$ ,  $R = 100 \Omega$ ,  $\alpha = 13$ .

Risposta:

$$g_{11} = -5, \quad g_{12} = 25 \Omega, \quad g_{21} = 0.08 \text{ S}, \quad g_{22} = 0.25.$$

**Esercizio n. 11**

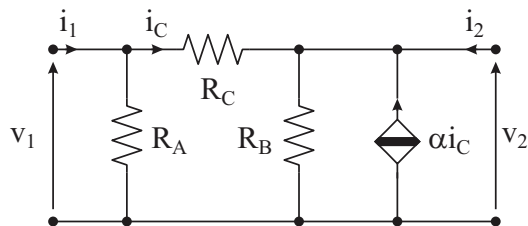
$$\begin{aligned} R_A &= 4 \Omega \\ R_B &= 2 \Omega \\ R_C &= 2 \Omega \\ r &= 4 \Omega \end{aligned}$$

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

**Risultati**

$$\begin{array}{cccc} r_{11} = 6 \Omega & r_{12} = 2 \Omega & r_{21} = 6 \Omega & r_{22} = 4 \Omega \\ h_{11} = 3 \Omega & h_{12} = 0.5 & h_{21} = -1.5 & h_{22} = 0.25 \text{ S} \end{array}$$


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**Esercizio n. 12**

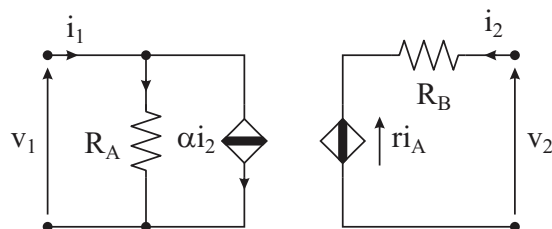
$$R_A = R_B = R_C = R$$

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

**Risultati**

$$\begin{array}{cccc} g_{11} = 2/R \text{ S} & g_{12} = -1/R \text{ S} & g_{21} = -(1+\alpha)/R \text{ S} & g_{22} = (2+\alpha)/R \text{ S} \\ h_{11} = R/2 \Omega & h_{12} = 1/2 & h_{21} = -(1+\alpha)/2 & h_{22} = (3+\alpha)/(2R) \text{ S} \end{array}$$


---

**Esercizio n. 13**

$$\begin{aligned} R_A &= 2 \Omega \\ R_B &= 4 \Omega \\ r &= 4 \Omega \\ \alpha &= 0.5 \end{aligned}$$

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

**Risultati**

$$\begin{array}{cccc} g_{11} = 0.25 \text{ S} & g_{12} = 0.125 \text{ S} & g_{21} = -0.5 \text{ S} & g_{22} = 0.25 \text{ S} \\ h_{11} = 4 \Omega & h_{12} = -0.5 & h_{21} = -2 & h_{22} = 0.5 \text{ S} \end{array}$$


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***Compiti di esame C.L. Ing. Informatica***

***(reperibili al seguente link:***

***<http://wwwelfin.diees.unict.it/esg/didattica/elettrotecnica/inf/compiti.html>***)

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