13.3. IMPEDANTE CARACTERISTICE

Un cuadripol alimentat direct (pe la bornele primare), care functioneaza in sarcina cu o impedanta $\underline{Z}_2 = \underline{U}_2 / \underline{I}_2$ conectata la bornele secundare (fig. 13.5) prezinta la bornele de alimentare o impedanta echivalenta complexa.

$$\underline{Z}_{ei} = \frac{\underline{U}_1}{\underline{Z}_1} = \frac{\underline{A}\underline{U}_2 + \underline{B}\underline{I}_2}{\underline{C}\underline{U}_2 + \underline{D}\underline{I}_2} = \frac{\underline{A}\underline{Z}_2 + \underline{B}}{\underline{C}\underline{Z}_2 + \underline{D}} \qquad (13.26)$$

numita impedanta de intrare primara si dependenta de impedanta de sarcina $\underline{Z}_2$. Un cvadripol alimentat invers (pe la bornele secundare) care functioneaza in sarcina cu o impedanta $\underline{Z}_1 = \underline{U}'_1 / \underline{I}'_1$, conectata la bornele primare (fig. 13.6), prezinta la bornele de alimentare o impedanta echivalenta complexa.

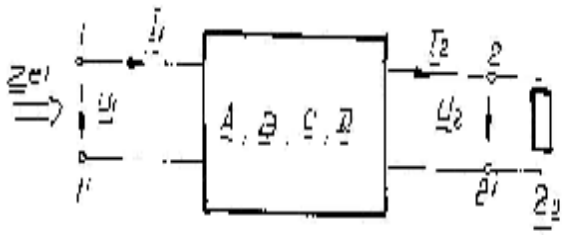


Fig. 13.5

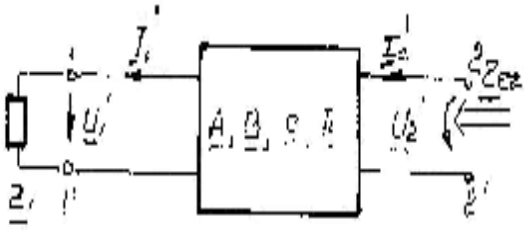


Fig. 13.6

$$\underline{Z}_{e2} = \frac{\underline{U}'_2}{\underline{I}'_2} = -\frac{\underline{U}_2}{\underline{I}_2} = \frac{\underline{D}\underline{U}'_1 + \underline{B}\underline{I}'_1}{\underline{C}\underline{U}'_1 + \underline{A}\underline{I}'_1} = \frac{\underline{D}\underline{Z}_1 + \underline{B}}{\underline{C}\underline{Z}_1 + \underline{A}} \qquad (13.27)$$

numita impedanta de intrare secundara si dependenta de sarcina $\underline{Z}_1$. In general, $\underline{Z}_{el} \neq \underline{Z}_2$; $\underline{Z}_{e2} = \underline{Z}_1$.

13.3.1. Impedante caracteristice (iterative)

Se numesc impedante caracteristice iterative ale unui cuadripol, o pereche de impedante $\underline{Z}_{c1}$ si $\underline{Z}_{c2}$, definite cum urmeaza:

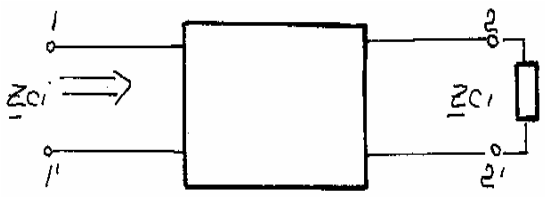
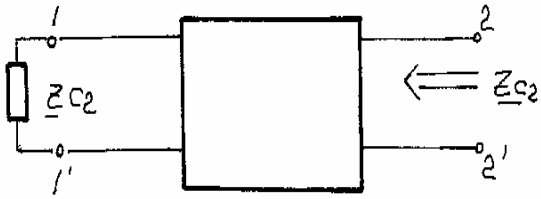


Fig. 13.7



13.8

Impedanta caracteristica directa $\underline{Z}_{c1}$ e impedanta de sarcina care trebuie conectata la bornele secundare, pentru ca impedanta de intrare primara sa fie egala cu ea, fig. 13.7.

$$\underline{Z}_2 = \underline{Z}_{c1} \rightarrow \underline{Z}_{ei} = \underline{Z}_{c1} \qquad (13.28)$$

Inlocuind aceste valori in (13.26) rezolvând ecuatia obtinuta in raport cu $\underline{Z}_{c1}$ se obtine cu relatia:

$$\underline{A}\underline{D}-\underline{B}\underline{C}=1$$

$$\underline{Z}_{c1}=\frac{\underline{A}-\underline{D}\pm\sqrt{(A+D)^2+4}}{2\underline{C}} \tag{13.29}$$

$$\underline{Z}_{c1}=\frac{1}{2}\left[\underline{Z}_{10}-\underline{Z}_{20}\pm\sqrt{(\underline{Z}_{10}-\underline{Z}_{20})^2+4\underline{Z}_{20}\cdot\underline{Z}_{lsc}}\right] \tag{13.30}$$

Impedanta caracteristica inversa Z_{c2} e impedanta de sarcina, care trebuie conectata la bornele primare, pentru ca impedanta de intrare secundara sa fie egala cu ea (fig. 13.8).

$$\underline{Z}_1=\underline{Z}_{c2}\rightarrow\underline{Z}_{e_2}=\underline{Z}_{c_2} \tag{13.31}$$

Inlocuind in (13.27) si rezolvând ecuatia obtinuta in raport cu $\underline{Z}_{c_2}$ se obtine:

$$\underline{Z}_{c2}=\frac{\underline{D}-\underline{A}\pm\sqrt{(\underline{A}+\underline{D})^2+4}}{2\underline{C}} \tag{13.32}$$

si in functie de impedantele in gol si s.c.

$$\underline{Z}_{c2}=\frac{1}{2}[\underline{Z}_{20}-\underline{Z}_{10}\pm\sqrt{(\underline{Z}_{10}-\underline{Z}_{20})^2+4\underline{Z}_{20}\underline{Z}_{lsc}}] \tag{13.33}$$

13.3.2. Impedante imagini

Se numesc impedante imagini, ale unui cuadripol o pereche de impedante $\underline{Z}_{i_1}$ si $\underline{Z}_{i_2}$, astfel incât prima e impedanta primara de intrare, sau a doua e impedanta de sarcina conectata la bornele secundare, iar a doua e impedanta secundara de intrare, daca prima e impedanta de sarcina conectata la bornele primare (fig. 13.9).

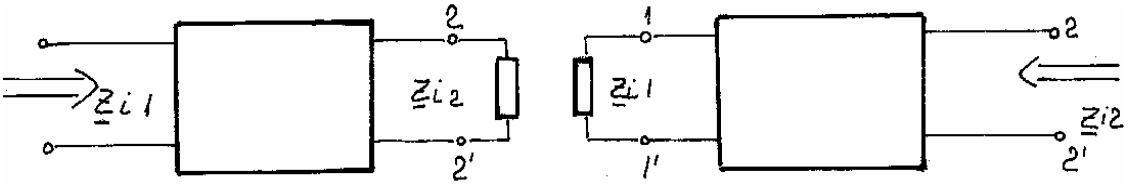


Fig. 13.9

$$\underline{Z}_2=\underline{Z}_{i2}\rightarrow\underline{Z}_{e1}=\underline{Z}_{i1}\text{ si }\underline{Z}_1=\underline{Z}_{i1}\rightarrow\underline{Z}_{e2}=\underline{Z}_{i2} \tag{13.34}$$

Introducând aceste conditii in (13.26), (13.27) se obtine cu $\Delta=\underline{A}\underline{D}-\underline{B}\underline{C}=1$, impedanta imagine primara

$$\underline{Z}_{i1}=\pm\sqrt{\frac{\underline{A}\underline{B}}{\underline{C}\underline{D}}}=\pm\sqrt{\underline{Z}_{10}\underline{Z}_{1Sc}} \tag{13.35}$$

si impedanta imagine secundara

$$\underline{Z}_{i2}=\pm\sqrt{\frac{\underline{D}\underline{B}}{\underline{C}\underline{A}}}=\pm\sqrt{\underline{Z}_{20}\underline{Z}_{2Sc}} \tag{13.36}$$

13.3.2.1. Impedante de mers in gol si de scurtcircuit

- Impedanta primara de mers in gol

$$\underline{Z}_{10} = \left(\frac{\underline{U}_1}{\underline{I}_1} \right)_{\underline{I}_{2=0}} = \frac{\underline{A}}{\underline{C}} = \underline{Z}_{11}$$

- Impedanta primara de scurtcircuit

$$\underline{Z}_{1sc} = \left(\underline{U}_1 / \underline{I}_1 \right)_{\underline{U}_{2=0}} = \frac{\underline{B}}{\underline{D}} = \frac{1}{\underline{Y}_{11}} \qquad (13.37)$$

- Impedanta secundara de mers in gol

$$\underline{Z}_{20} = \left(\underline{U}'_2 / \underline{I}'_2 \right)_{\underline{I}'_{=0}} = \frac{\underline{D}}{\underline{C}} = -\underline{Z}_{22}$$

- Impedanta secundara de scurtcircuit

$$\underline{Z}_{2sc} = \left(\underline{U}'_2 / \underline{I}'_2 \right)_{\underline{U}'_{1=0}} = \frac{\underline{B}}{\underline{A}} = -\frac{1}{\underline{Y}_{22}}.$$