

ELECTRICAL CIRCUIT THEORY

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Task III_1

It is considered a two-port circuit with reciprocal linear elements, resistors and an impedance “matching” transformer (an ideal transformer or an inductive impedance converter), Figure III_1.

Find:

- its a – parameters (transmission parameters),
- the transmission number m so that the two port is electrically symmetrical,
- using the solution from a) and the result from b), find the characteristic parameters, characteristic impedance and characteristic transmission number, Z_c and γ_c .

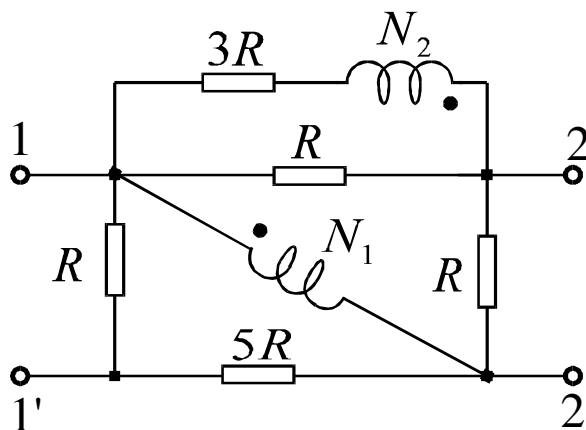


Fig. III_1

Definition of a -parameters

Case a/	Case b/
$\begin{bmatrix} U_1 \\ I_1 \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} U_2 \\ -I_2 \end{bmatrix}$	$\begin{bmatrix} U_1 \\ I_1 \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} U_2 \\ I_2 \end{bmatrix}$
$U_1 = a_{11}U_2 - a_{12}I_2$	$U_1 = a_{11}U_2 + a_{12}I_2$
$I_1 = a_{21}U_2 - a_{22}I_2$	$I_1 = a_{21}U_2 + a_{22}I_2$
$\begin{bmatrix} U_1 \\ I_1 \end{bmatrix} = \begin{bmatrix} A & B \\ C & D \end{bmatrix} \begin{bmatrix} U_2 \\ -I_2 \end{bmatrix}$	$\begin{bmatrix} U_1 \\ I_1 \end{bmatrix} = \begin{bmatrix} A & B \\ C & D \end{bmatrix} \begin{bmatrix} U_2 \\ I_2 \end{bmatrix}$
$U_1 = AU_2 - BI_2$	$U_1 = AU_2 + BI_2$
$I_1 = CU_2 - DI_2$	$I_1 = CU_2 + DI_2$
$a_{11}a_{22} - a_{12}a_{21} = 1,$	$a_{11}a_{22} - a_{12}a_{21} = 1,$
$AD - BC = 1$	$AD - BC = 1$