$$S = VI \; 10\underline{/-15}$$
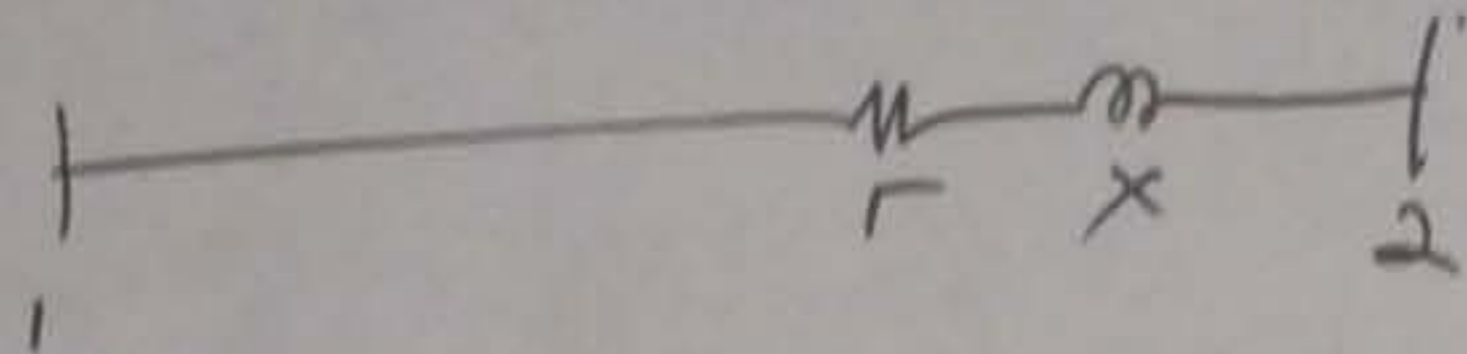
$$\checkmark S = VI^{*}$$

$$S = V^{*}I$$

$$\checkmark S = P + jQ$$

$$S = P - jQ$$

$$Z_{12} = r + jx$$

$$y_{12} = admitansi$$

$$= \frac{1}{z_{12}} = \frac{1}{r + jx}$$

$$= G + jB$$

$$\underset{konduktansi}{\uparrow} \quad \underset{susceptansi}{\uparrow}$$

$$I = 10\underline{/15}$$

$$I^{*} = 10\underline{/-15}$$

$$V = 10 + j8$$

$$V^{*} = 10 - j8$$

$$G = f(r,x)$$

$$B = f(r,x)$$

$$I_{12} = \frac{V_{12}}{r+jx} = \frac{V_1 - V_2}{r+jx}$$

$$S = VI$$

$$\checkmark S = VI^*$$

$$I = \frac{10\angle 15}{}$$

$$I^* = 10\angle{-15}$$

$$G = \frac{r}{r^2 + x^2}$$

$$S = V^* I$$

$$Z_{12} = r + jx$$

$$B = \frac{x}{r^2 + x^2}$$

$$I = \frac{\text{tegangan}}{\text{impedansi}}$$

$$\checkmark S = P + jQ$$

$$I = \frac{V}{R}$$

$$Y_{12} = \text{admitansi}$$

$$V = 10 + j8$$

$$V^* = 10 - j8$$

$$S = P - jQ$$

$$= \frac{1}{Z_{12}} = \frac{1}{r+jx}$$

$$= G + jB$$

$$\underset{\text{konduktansi}}{\uparrow} \quad \underset{\text{susceptansi}}{\uparrow}$$

$$G = f(r, x)$$

$$B = f(r, x)$$

$$\frac{1}{2 + j10} \times \frac{(2 - j10)}{(2 - j10)} = \frac{2 - j10}{4 - (j10)^2} = \frac{2 - j10}{4 - (-100)} = \frac{2 - j10}{104}$$

$$\bar{S}_{12} + \bar{S}_{21} = ? \quad = \text{rugi daya pada saluran.}$$

$$P_{12} = V_1 I_{12} \cos(\theta_1 - \phi_{12})$$

$$Q_{12} = V_1 I_{12} \sin(\theta_1 - \phi_{12})$$

$$\bar{S} = \bar{U}\bar{I}^*$$

$$P_{12} = e_1 I_{x_{12}} + f_1 I_{y_{12}} \qquad Q_{12} = f_1 I_{x_{12}} - e_1 I_{y_{12}}$$
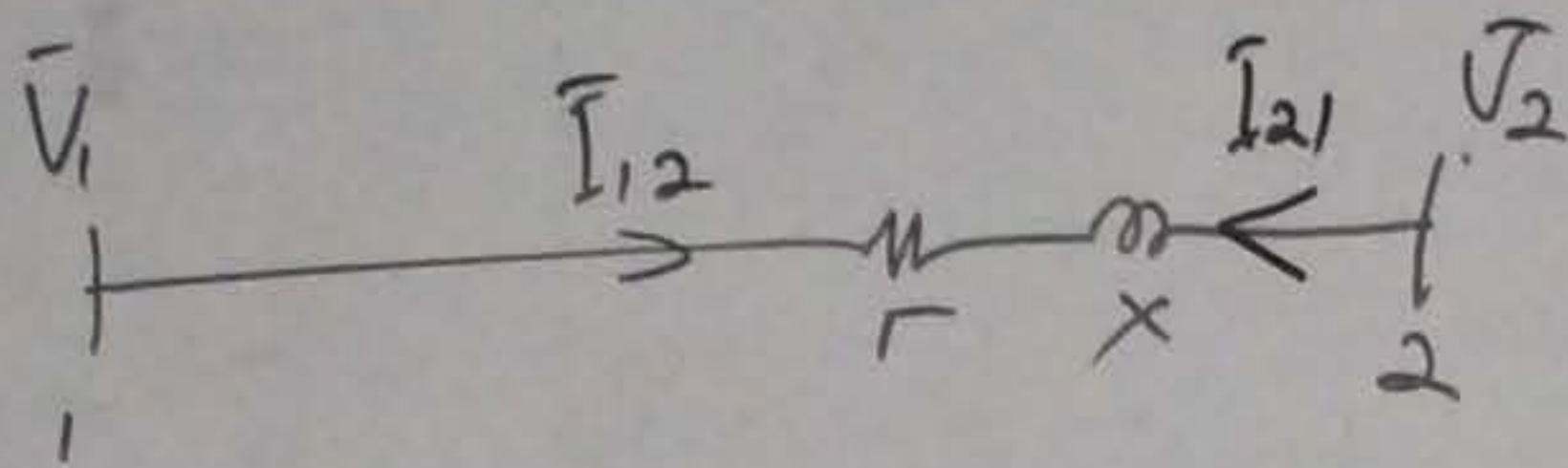
$$\bar{V}_1 = V_1 \angle \theta_1 = e + jf$$

$$\bar{I}_{12} = I_{12} \angle \phi_{12} = I_x + jI_y$$

$$\boxed{\bar{S}_{12} = V_1 \, I_{12} \, \angle \theta_1 - \phi_{12}}$$

$$\bar{S}_{12} = eI_x - ejI_y + jI_x f + fI_y$$

$$= \underbrace{eI_x + fI_y}_{P_{12}} + \underbrace{j(fI_x - eI_y)}_{Q_{12}}$$

$$\bar{I}_{12} = \frac{\bar{V}_{12}}{r + jx} = \frac{\bar{V}_1 - \bar{V}_2}{r + jx}$$

$$\bar{I}_{12} = \frac{\bar{V}_{12}}{\bar{Z}_{12}} = y_{12} V_{12}$$

$$y_{12} = \frac{1}{\bar{Z}_{12}} \qquad G_{12} = \frac{r}{r^2 + x^2}$$

$$B_{12} = \frac{x}{r^2 + x^2}$$

$$\dot{S}_{12} = \bar{V}_1 \, \bar{I}_{12}^*$$

$$\bar{S}_{12} = \bar{S}_{21}$$
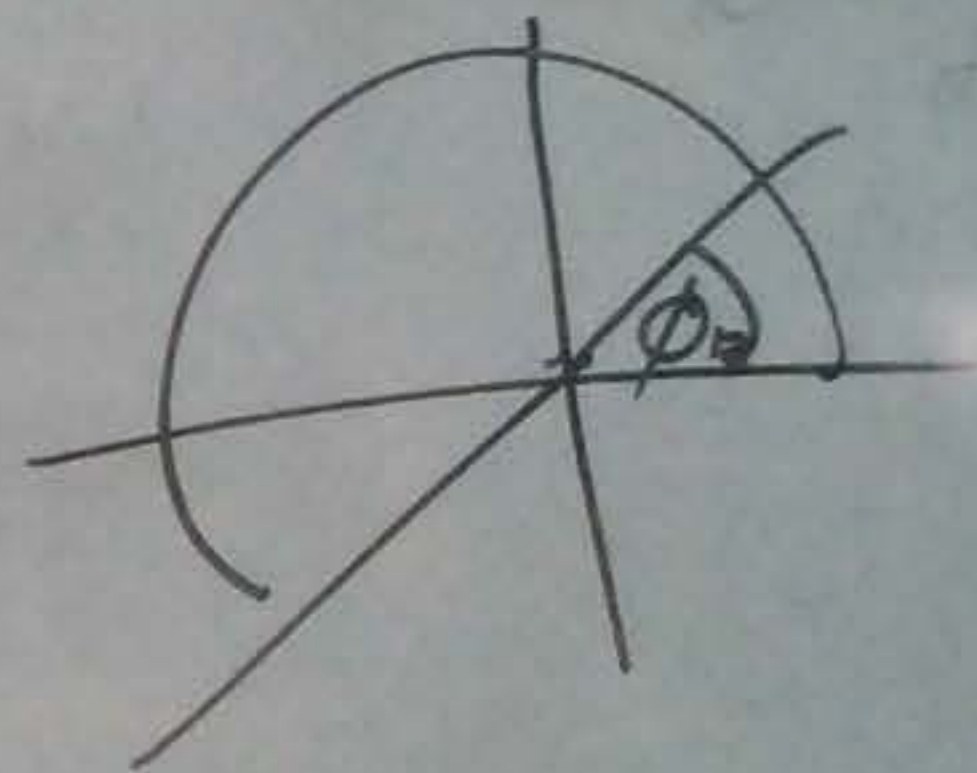
$$\neq$$

$$\bar{J}_{21} = \frac{\bar{V}_2 - \bar{V}_1}{\bar{Z}_{12}} = y_{12}(\bar{V}_2 - \bar{V}_1)$$

$$= \boxed{- \bar{I}_{12}}$$

$$\dot{S}_{21} = \bar{V}_2 \, \bar{I}_{21}^*$$

$$= - \bar{V}_2 \, I_{12}^*$$

$$P_{21} = V_2 I_{21} \cos(\theta_2 - \phi_{21})$$

$$\bar{I}_{12} = - \bar{I}_{21}$$

$$I_{12} = I_{21}$$

$$\phi_{12} = \phi_{21} + 180$$

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$$\bar{S}_{12} + \bar{S}_{21} = ? \quad = \text{rugi daya pada saluran.}$$

$$P_{12} = V_1 I_{12} \cos(\theta_1 - \phi_{12})$$

$$Q_{12} = V_1 I_{12} \sin(\theta_1 - \phi_{12})$$

$$\bar{S} = \bar{U}\bar{I}^*$$

$$\bar{S}_i = \bar{V}_i \sum_{\partial} V_i^* y_{i\partial}^* - V_{\partial}^* \bar{y}_{i\partial}^{-*}$$

$$\bar{I}_{21} = \frac{\bar{V}_2 - \bar{V}_1}{\bar{z}_{12}} = y_{12}(\hat{V}_2 - \hat{V}_1)$$

$$= (-I_{12})$$

$$= V_1 \sum_{J=2}(V_1^* y_{12}^* - V_J^* y_{12}^*)$$

$$\bar{S}_1 = \bar{V}_1 \bar{I}_{12}^* + \bar{V}_1 \bar{I}_{13}^*$$

$$= \bar{V}_1\left[(\bar{V}_1 - \bar{V}_2)y_{12}\right]^* + \bar{V}_1\left[(\bar{V}_1 - \bar{V}_3)y_{13}\right]^*$$

$$= \bar{V}_1\left[(\bar{V}_1^* - \bar{V}_2^*)y_{12}^*\right] + \bar{V}_1\left[(\bar{V}_1^* - \bar{V}_3^*)\bar{y}_{13}^*\right]$$

$$= \bar{V}_1\left[\bar{V}_1^*\bar{y}_{12}^* - \bar{V}_2^*\bar{y}_{12}^* + \bar{V}_1^*\bar{y}_{13}^* - V_3^*y_{13}^*\right]$$

$$= \bar{V}_1\left[V_1^*y_{12}^* + V_1^*y_{13}^* - (V_2^*y_{12}^* + V_3^*y_{13}^*)\right]$$

$$= V_1\left[V_1^*\sum_{J=2}^{3}y_{1J} - \sum_{J=2}^{3}V_J^*y_{1J}^*\right]$$

no	Saluran		r	x
	dari	ke		
1	2	2	r_{12}	x_{12}
2	1	3	r_{13}	x_{13}
3	2	3	r_{23}	x_{23}

$$P_i = f(V_j, \theta_j, y_{ij})$$

$$\theta_i = f(V_i, \theta_i, y_{ij})$$

$$\bar{S}_1 = \bar{S}_{12} + \bar{S}_{13}$$

$$\bar{S}_2 = \bar{S}_{21} + \bar{S}_{23}$$

$$\bar{S}_3 = \bar{S}_{31} + \bar{S}_{32}$$

$$S_4 = \cdots \cdots$$

$$j \in \{2,3\}$$

$$\bar{S}_2 = \bar{V}_2 \sum_{\partial} V_2^* y_{2J}^* - V_{\partial}^* y_{21}^*$$

$$j \in \{1,3\}$$

$$S_3 = V_3 \sum_{\partial} V_3^* y_{3\partial}^* - V_{\partial}^* y_{3\partial}^*$$

$$j \in \{1,2\}$$

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$\bar{S}_{12} + \bar{S}_{21} = ?$:= rugi daya pada saluran.

$P_{12} = V_1 I_{12} \cos(\theta_1 - \phi_{12})$
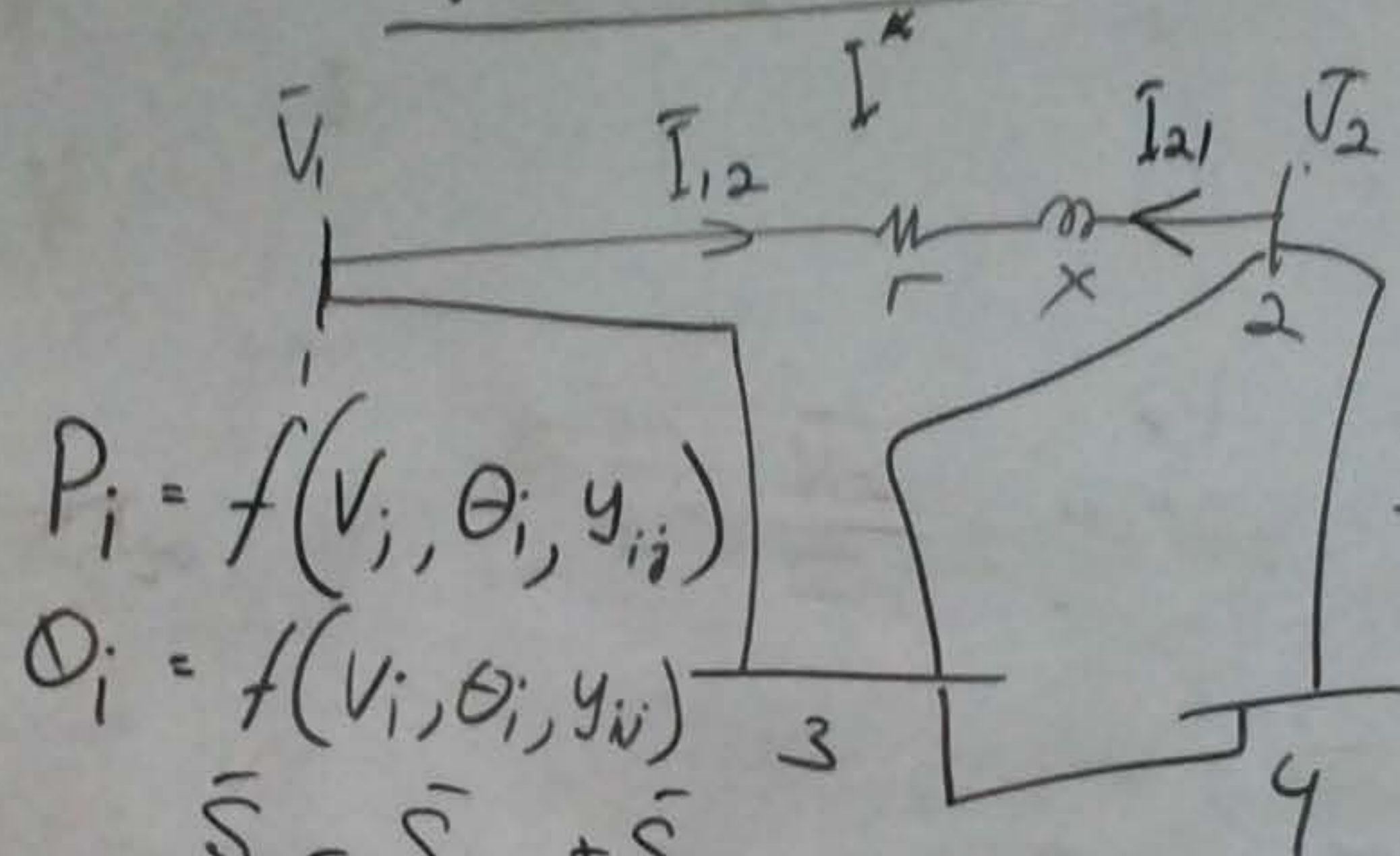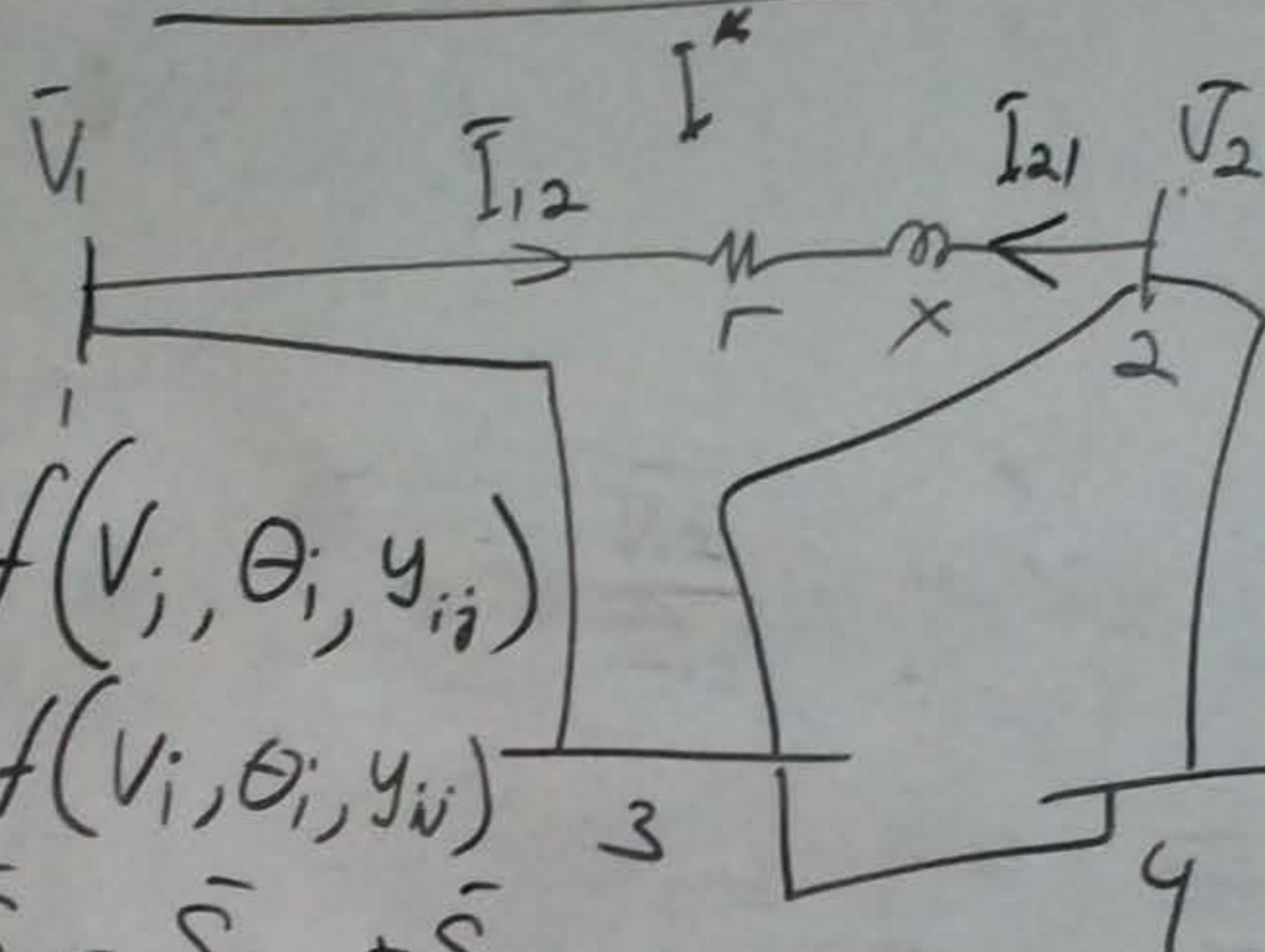
$Q_{12} = V_1 I_{12} \sin(\theta_1 - \phi_{12})$

$$\bar{S}_i = \bar{V}_i \sum_{\partial} \overline{V_i^* y_{i\partial}^* - V_{\partial}^* \bar{y}_{i\partial}^{-*}}$$

$\bar{I}^*$

$$\bar{J}_{21} = \frac{\bar{V}_2 - \bar{V}_1}{\bar{Z}_{12}} = \bar{y}_{12}(\bar{V}_2 - \bar{V}_1)$$

$= \left| -\frac{\bar{I}_{12}}{} \right|$

$\bar{S} = \bar{U} \bar{I}^*$

$P_i = f(V_j, \theta_i, y_{ij})$

$\Theta_i = f(V_i, \theta_i, y_{ij})$

$\bar{S}_1 = \bar{S}_{12} + \bar{S}_{13}$

$\bar{S}_2 = \bar{S}_{21} + \bar{S}_{23}$

$\bar{S}_3 = \bar{S}_{31} + \bar{S}_{32}$

$S_4 = \ - \ - \ - \ .$

$j \in \{2,3\}$

Saluran

dari	ke	r	x
2	2	r_{12}	x_{12}
1	3	r_{13}	x_{13}
2	3	r_{23}	x_{23}

$$\bar{S}_2 = \bar{V}_2 \sum_{\partial} \overline{V_2^* y_{2j}^* - V_{\partial}^* y_{2j}^*}$$

$j \in \{1,3\}$

$$\bar{S}_3 = \bar{V}_3 \sum_{\partial} \overline{V_3^* y_{3j}^* - V_{\partial}^* y_{3j}^*}$$

$j \in \{1,2\}$

$$= V_1 \sum_{J=2}^{} (V_1^* y_{1\partial}^* - V_j^* y_{1j}^*)$$

$\bar{S}_1 = \bar{V}_1 \bar{I}_{12}^* + \bar{V}_1 \bar{I}_{13}^*$

$= \bar{V}_1 \left[(\bar{V}_1 - \bar{V}_2) y_{12} \right]^* + \bar{V}_1 \left[(\bar{V}_1 - \bar{V}_3) y_{13} \right]^*$

$= \bar{V}_1 \left[(\bar{V}_1^* - \bar{V}_2^*) y_{12}^* \right] + \bar{V}_1 \left[(\bar{V}_1^* - \bar{V}_3^*) \bar{y}_{13}^* \right]$

$= \bar{V}_1 \left[\bar{V}_1^* \bar{y}_{12}^* - \bar{V}_2^* \bar{y}_{12}^* + \bar{V}_1^* \bar{y}_{13}^* - V_3^* y_{13}^* \right]$

$= \bar{V}_1 \left[V_1^* y_{12}^* + V_1^* y_{13}^* - (V_2^* y_{12}^* + V_3^* y_{13}^*) \right]$

$= V_1 \left[V_1^* \sum_{J=2}^{3} y_{1j} - \sum_{\partial=2}^{3} V_{\partial}^* y_{1\partial}^* \right]$