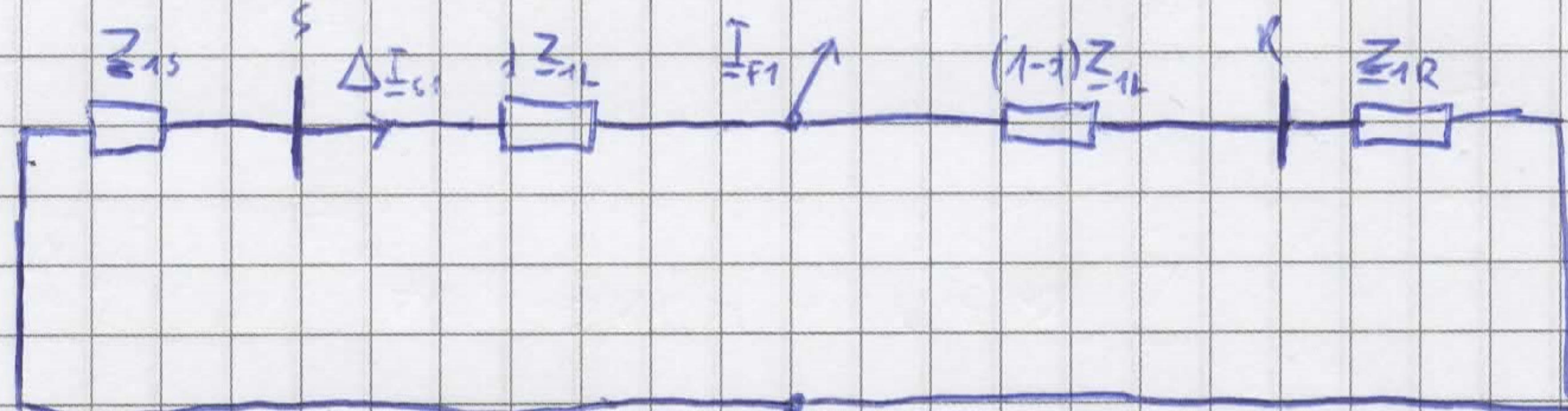
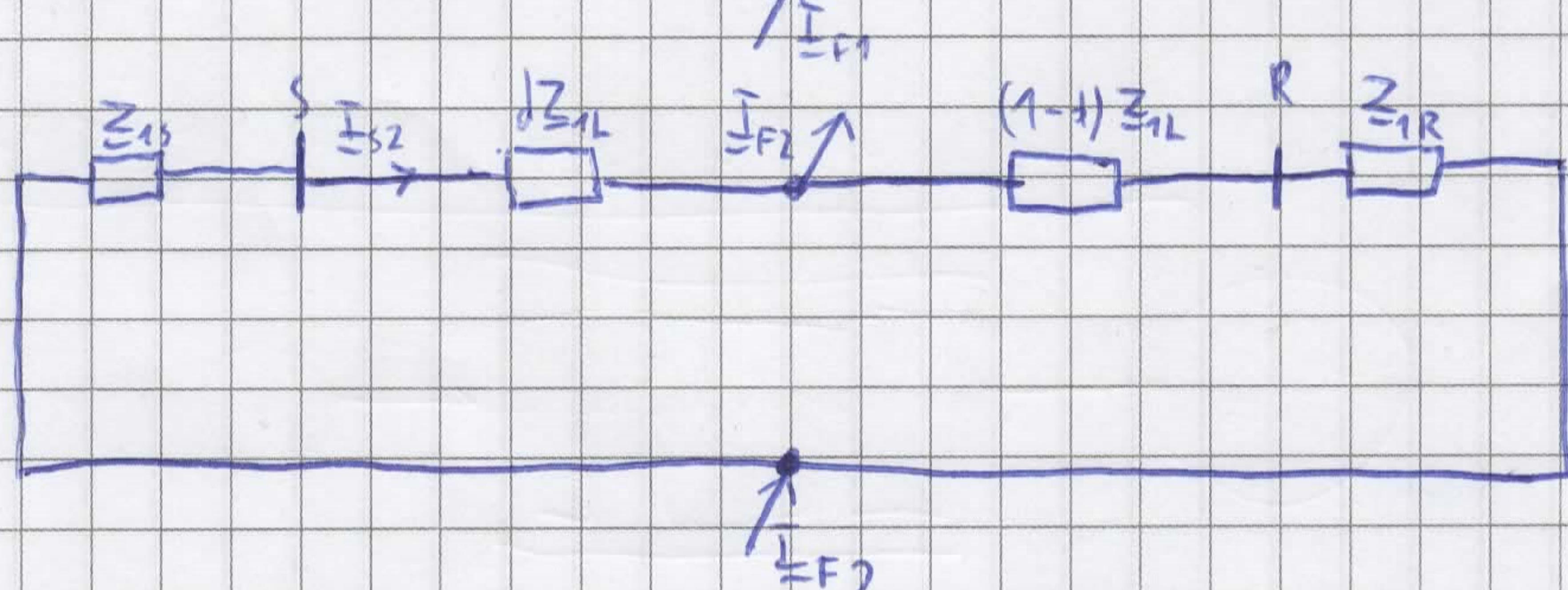
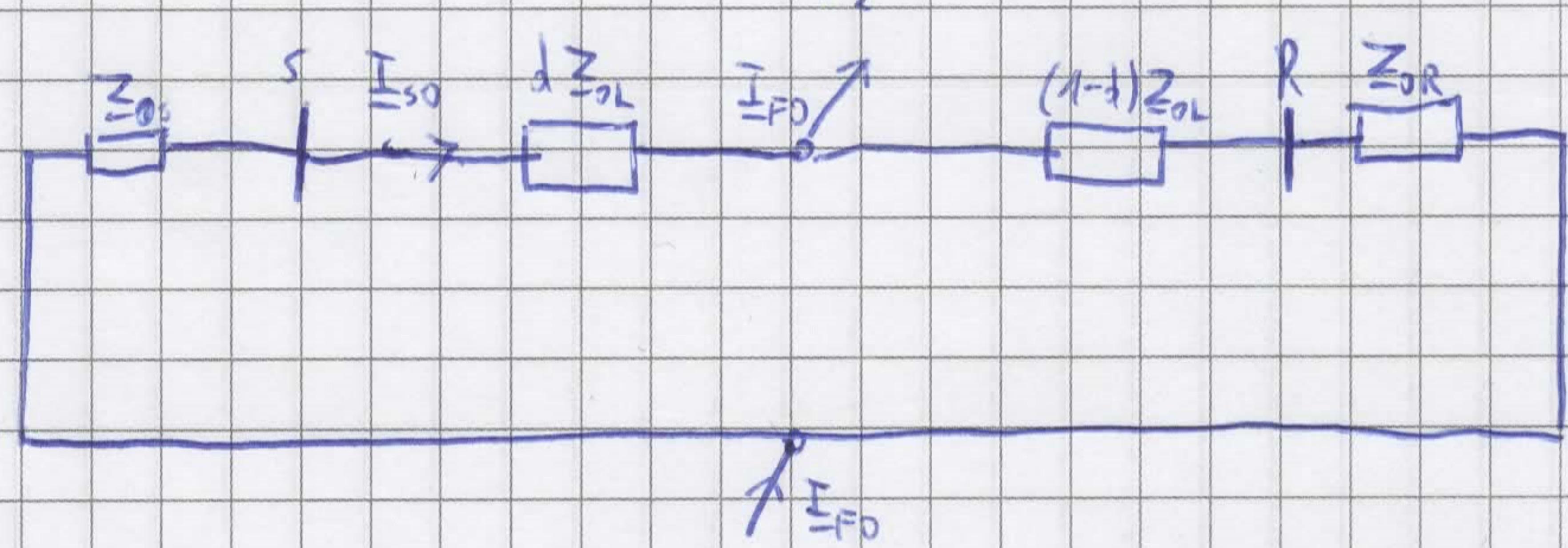


$$\begin{bmatrix} I_0 \\ I_1 \\ I_2 \end{bmatrix} = \frac{1}{3} \begin{bmatrix} 1 & 1 & 1 \\ 1 & a & a^2 \\ 1 & a^2 & a \end{bmatrix} \cdot \begin{bmatrix} 0 \\ I_F \\ I_F \end{bmatrix} \rightarrow \begin{aligned} I_0 &= \frac{1}{3} (0 - I_F + I_F) = 0 \\ I_1 &= \frac{1}{3} (0 - aI_F + a^2I_F) = \frac{1}{3}a(aI_F - I_F) \\ I_2 &= \frac{1}{3} (0 - a^2I_F + aI_F) = \frac{1}{3}a(I_F - aI_F) \end{aligned}$$

szk. zgodna  
przyrostowa

szk. przycienna



szk. zerowa

$$I_{F1} = \frac{Z_{1S} + Z_{1L} + Z_{1R}}{(1-a)Z_{1L} + Z_{1R}} \Delta I_{S1} \quad | \quad \text{Z WAD. POLAZITOWYCH:}$$

$$I_{F1} = \frac{1}{3}aI_F(a-1) \rightarrow I_F = \frac{3I_{F1}}{a^2-a}$$

$$I_{F2} = \frac{Z_{1S} + Z_{1L} + Z_{1R}}{(1-a)Z_{1L} + Z_{1R}} \Delta I_{S2} \quad | \quad I_{F2} = \frac{1}{3}aI_F(1-a) \rightarrow I_F = \frac{3I_{F2}}{a-a^2}$$

$$I_{F3} = \frac{Z_{1S} + Z_{1L} + Z_{1R}}{(1-a)Z_{1L} + Z_{1R}} \Delta I_{S3} \quad | \quad \begin{aligned} a &= e^{j22^\circ} = -0,5 + j\frac{\sqrt{3}}{2} \\ a^2 &= e^{j44^\circ} = -0,5 - j\frac{\sqrt{3}}{2} \end{aligned}$$

$$I_F = 3 \cdot \frac{I_{F1}}{-0,5 - j\frac{\sqrt{3}}{2} + 0,5 - j\frac{\sqrt{3}}{2}} = 3 \cdot \frac{I_{F1}}{-j\sqrt{3}} = I_{F1} \cdot j\sqrt{3} = j\sqrt{3} I_{F1}$$

$$I_F = 3 \cdot \frac{I_{F2}}{-0,5 + j\frac{\sqrt{3}}{2} + 0,5 + j\frac{\sqrt{3}}{2}} = 3 \cdot \frac{I_{F2}}{j\sqrt{3}} = I_{F2} \cdot (-j\sqrt{3}) = -j\sqrt{3} I_{F2}$$

PRZYRÓWNANIE:

$$j\sqrt{3} I_{F1} = -j\sqrt{3} I_{F2} \rightarrow j\sqrt{3} \cdot \frac{Z_{1S} + Z_{1L} + Z_{1R}}{(1-a)Z_{1L} + Z_{1R}} \Delta I_{S1} = -j\sqrt{3} \frac{Z_{1S} + Z_{1L} + Z_{1R}}{(1-a)Z_{1L} + Z_{1R}} \Delta I_{S2}$$

Po uproszczeniu:  $\Delta I_{S1} = -\Delta I_{S2}$ 

$$\alpha_\Delta = \arg\left(\frac{\Delta I_{S2}}{\Delta I_{S1}}\right) \cdot \frac{180^\circ}{\pi} = \arg(-1) \cdot \frac{180^\circ}{\pi} = 180^\circ$$

