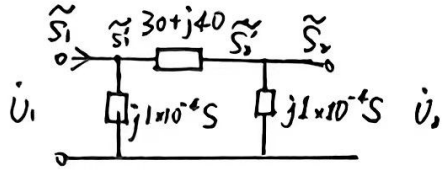
Power System. Analysis

Practice 1



已知始端推末端

始端对地支路功率损耗为

$$\begin{aligned}\Delta\tilde{S}_{y1} &= \Delta P_{y1} + j\Delta Q_{y1} \\ &= \dot{U}_1 (\tfrac{1}{2} Y \dot{U}_1)^* \\ &= 112^2 (-j1\times10^{-4}) \\ &= -j1.2544 \ (MVA)\end{aligned}$$

线路始端阻抗功率

$$\begin{aligned}\tilde{S}_1' &= P_1' + jQ_1' \\ &= \tilde{S}_1 - \Delta\tilde{S}_{y1} \\ &= 20 + j8.7456 - (-j1.2544) \\ &= 20 + j10 \ (MVA)\end{aligned}$$

支路功率损耗

$$\begin{aligned}\Delta\tilde{S}_2 &= \Delta P_2 + j\Delta Q_2 \\ &= \left(\frac{S_1'}{U_1}\right)^2 Z \\ &= \left(\frac{20+j10}{110}\right)^2 (30+j40) \\ &= 1.23 + j1.64 \ (MVA)\end{aligned}$$

支路电压损耗.

$$\Delta U_2 = \frac{20\times30 + 10\times40}{112} = 8.9286 \ (kV)$$

$$\delta U_{12} = \frac{20\times40 - 10\times30}{112} = 4.4643 \ (kV)$$

末端电压

$$\begin{aligned}U_2 &= \left(U_1 - \frac{P_1'R + Q_1'X}{U_1}\right) - j\frac{P_1'X - Q_1'R}{U_1} \\ &= 103.07 - j0.45 \ (V)\end{aligned}$$

则 $U_2 = \sqrt{(112-8.9286)^2 + 4.4643^2}$

$= 103.1681 \ (kV)$

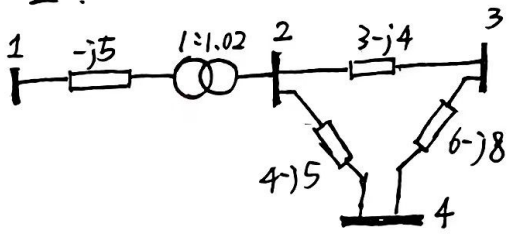
末端功率

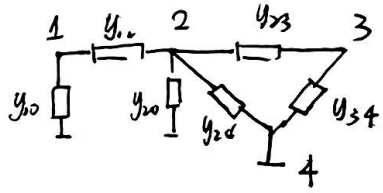
$\tilde{S}_2 = P_2 + jQ_2$

$= \tilde{S}_2' - \Delta\tilde{S}_{T_2}$

$= 18.77 + j9.422 \ (MVA)$

Practice 2.





$y_{12} = \frac{1}{-j5 \times 1.02} = j0.167$

$y_{10} = \frac{1.02-1}{-j5 \times 1.02} = j0.003$

$y_{20} = \frac{1-1.02}{-j5 \times 1.02} = -j0.004$

$y_{23} = \frac{1}{3-j4} = 0.12 + j0.16$

$y_{24} = \frac{1}{4-j5} = 0.1 + j0.61$

$y_{34} = \frac{1}{6-j8} = 0.06 + j0.08$

节点导纳

$Y_{11} = y_{10} + y_{12} = -j0.170$

$Y_{22} = y_{20} + y_{12} + y_{23} + y_{24} = 0.22 + j0.933$

$Y_{33} = y_{23} + y_{34} = 0.18 + j0.24$

$Y_{44} = y_{24} + y_{34} = 0.16 + j0.69$