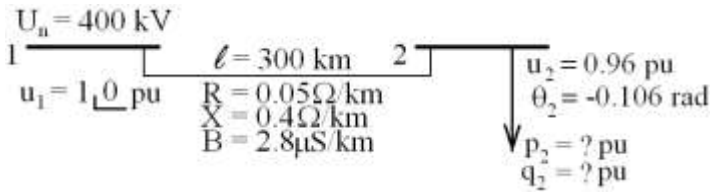
Example: Calculate active and reactive power load in bus no. 2, active and reactive power losses and percentual loading (S_{MVA} = 400 MVA). Use per units (S_V = 100 MVA), round the results on 5 decimal places.



Calculation:

$$\underline{y}_{12} = \frac{1}{(R + jX)l} \times \frac{U_n^2}{S_v} = 1.641026 - j13.128205\ pu$$

$$\underline{y}_{120} = jB\frac{l}{2} \times \frac{U_n^2}{S_v} = j0.672\ pu$$

Set of equations:

$$\begin{bmatrix} \frac{p_1 - jq_1}{v_1\angle -\theta_1} \\ \frac{p_2 - jq_2}{v_2\angle -\theta_2} \end{bmatrix} = \begin{bmatrix} y_{12} + y_{120} & -y_{12} \\ -y_{12} & y_{12} + y_{120} \end{bmatrix} \begin{bmatrix} v_1\angle\theta_1 \\ v_2\angle\theta_2 \end{bmatrix}$$

$$\begin{bmatrix} \frac{p_1 - jq_1}{1\angle 0°} \\ \frac{p_2 - jq_2}{0.96\angle 6°4'} \end{bmatrix} = \begin{bmatrix} 1.641026 - j12.456205 & -1.641026 + j13.128205 \\ -1.641026 + j13.128205 & 1.641026 - j12.456205 \end{bmatrix} \begin{bmatrix} 1\angle 0° \\ 0.96\angle -6°4' \end{bmatrix}$$

When entering known input values:

$$p_1 = 1.40643\ pu \qquad q_1 = -0.24279\ pu \qquad p_2 = -1.38616\ pu \qquad q_2 = -0.88636\ pu$$

Power losses are:

$$\Delta p = p_1 + p_2 = 1.40643 + -1.38616 = 0.02027\ pu$$
$$\Delta q = q_1 + q_2 = -0.24279 + -0.88636 = -1.12915\ pu$$

Line loadings are:

$$\text{loading from left} = \frac{\sqrt{p_1^2+q_1^2}}{\frac{400}{100}} \times 100\% = 35.681\%$$

$$\text{loading from right} = \frac{\sqrt{p_2^2+q_2^2}}{\frac{400}{100}} \times 100\% = 41.133\%$$

The higher value wins, so 41.133 %.