Solution of homework 2

a. Draw the sketch of the 3-phases circuit and its corresponding single-phase equivalent circuit

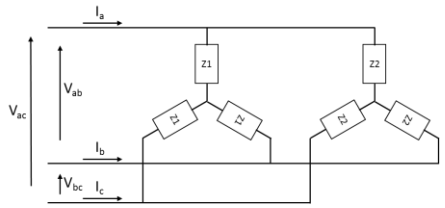

Fig 1: two parallel connected 3-phase loads. Both loads are wye-connected. In the exercise there is no mention of the source connection, but in 3-phases systems the voltage is always the line-to-line voltage, unless otherwise mentioned.

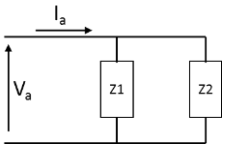

Fig 2: Single-phase equivalent circuit $V_a = \frac{V_{ab}}{\sqrt{3}}$

b. Calculate the source line current

$I_a = I_{z1} + I_{z2}$, where $I_{z1} = 20\angle \text{acos}(0,9) = 20\angle 25,84°$ $I_{z2} = 30\angle -\text{acos}(0,8) = 30\angle -36,87°$, i.e.,

$$I_a = 20\angle 25,84° + 30\angle -36,87°$$
$$= 43,014\angle -12,46° \text{ A}$$

the rms value of the line current is 43,01 A

c. Calculate the power factor of the whole load

From the above we can see that the angle of the current is $-12,46°$. The power factor is thus: $\cos(-12,46) = 0,976$. The minus sign means that the whole load is inductive (lagging current).