Using Smath for Electrical Engineering (Complex Domain with units)
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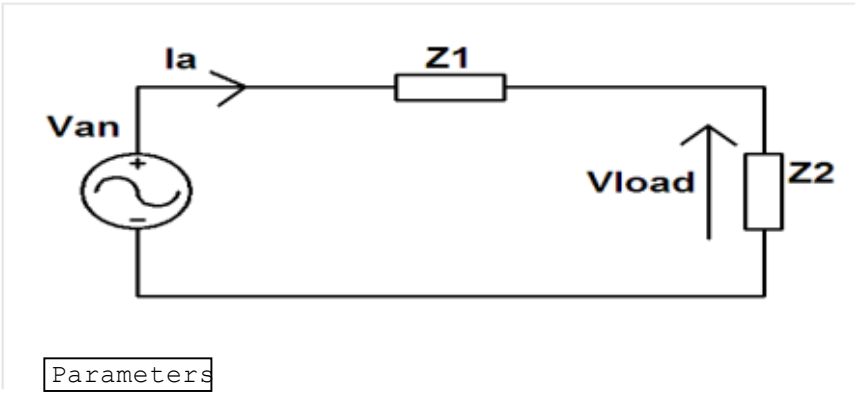

Custom Units

$VA := W$

$var := W$

Note: VA and var are dimensionally equivalent to Watts but Elec Eng uses them for apparent and reactive power

Custom Function

$conj(X) := \frac{|X|^2}{X}$

Note: Complex Conjugate function Useful for calculating Complex Power

Parameters

$Van := 230\ V$

$Z1 := (1 + i \cdot 2)\ \Omega$ $Z2 := (10 + i \cdot 5)\ \Omega$

Calculating the Current

$Ia := \frac{Van}{Z1 + Z2}$ $Ia = (14.88 - 9.47 \cdot i)\ A$

Polar Form $|Ia| = 17.64\ A$ $\arg\left(\frac{Ia}{1\ A}\right) = -32.47\ °$

Note: Magnitude function is entered as abs()

Note: Current version of Smath (0.96 build 4909) cannot take arg() of a number with units. Dividing by 1 Amp removes the units to allow arg() to be used

Load Voltage

$Vload := Ia \cdot Z2$ $Vload = (196.18 - 20.29 \cdot i)\ V$

Polar Form $|Vload| = 197.22\ V$ $\arg\left(\frac{Vload}{1\ V}\right) = -5.91\ °$

Complex Power

$Sload := Vload \cdot conj(Ia)$ $Sload = 3111.76 + 1555.88 \cdot i\ VA$

$P := Re\left(\frac{Sload}{1\ VA}\right) W$ $P = 3111.76\ W$

$Q := Im\left(\frac{Sload}{1\ VA}\right) var$ $Q = 1555.88\ var$

Note: Re() and Im() functions won't work with units so I divide by 1VA and multiply by correct unit after function

Note: Since VA and var are not standard units I defined them above and manually selected the desired unit by clicking on the box after tne default unit

$PF := \frac{P}{|Sload|}$ $PF = 0.89$