1. A 3-phase circuit is connected as shown.
   Find the following:

   a) The load power factor, assume lagging.

   b) The line current.

   c) The phase impedance, Z_ϕ

   d) The value of Y-connected impedances that would result
      in exactly the same line currents and same pf.

   e) The reactive power of each Z_ϕ

   f) Correct the power factor with capacitors
      connected in a wye configuration.

3ϕ source

$P_{3\phi} := 18 \cdot kW$

$S_{3\phi} := 21 \cdot kVA$

$V_S := 520 \cdot V$

$\omega := 377 \cdot \dfrac{rad}{sec}$
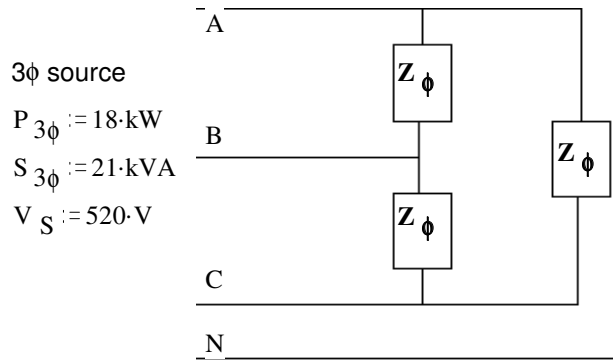
2. For the three-phase circuit shown, the R_{line}
   resistors represent the resistance of the
   distribution system.   Find the following:

   a) Total power out of the source, including line and load.

   b) Line losses.

   c) Distribution system efficiency.

$V_S := 480 \cdot V$

3ϕ source

$R_{line} := 0.2 \cdot \Omega$

$R_\phi := 25 \cdot \Omega$
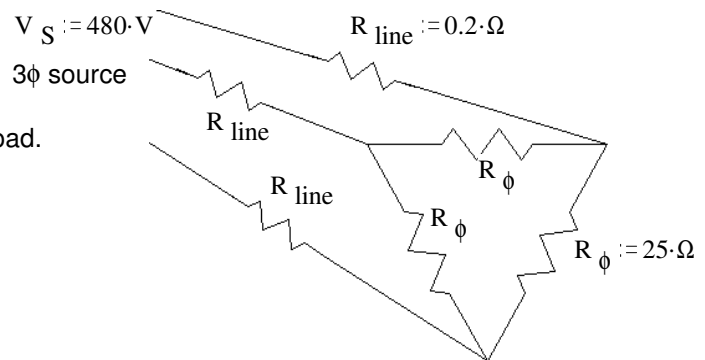
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   a) & b) For the apparent power, just the total will be sufficient.

   For the two parts below, assume the source voltage is ajusted so that the bus voltage at the plant remains 480V

   and the lines each have an impedance of $Z_{line} := (0.05 + j \cdot 0.1) \cdot \Omega$

   c) With the switch open, find the magnitude of the source voltage and the efficiency of the system.

   d) With the switch closed, find the magnitude of the source voltage and the efficiency of the system.

Answers

1. a) 0.857	2. a) 27·kW	3. a) 59.86·kW	b) Loads 1 & 2 are the same	c) 505.4·V
b) 23.3·A	b) 632.8·W	34.56·kVAR		96.8·%
c) 38.6·Ω $\underline{/}$ 31·deg	c) 97.7%	46.04·kW	Caps 0·W	
d) 12.9·Ω $\underline{/}$ 31·deg		34.53·kVAR		d) 496.0·V
e) 3.61·kVAR		input:	-46.06·kVAR	97.6·%
f) 106·µF		105.9·kW	input:	
		69.09·kVAR	105.9·kW	
		126.4·kVA	23.03·kVAR	
		152·A	108.4·kVA	
			130.4·A	