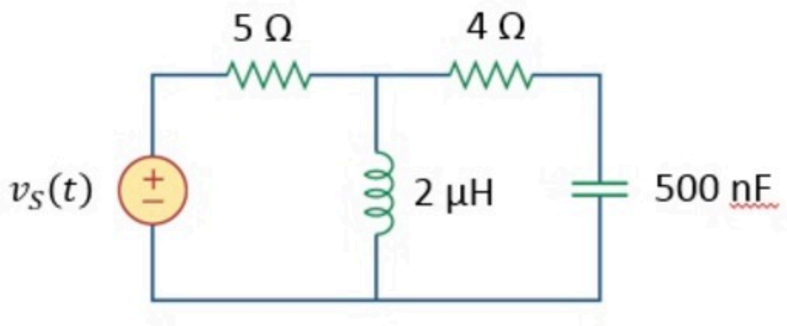
# PP AC power 006

Unlimited Attempts.

$$v_S(t) = 10\sqrt{2} \cdot \cos\left(10^6 t + \frac{\pi}{6}\right) \text{V}$$

Find the average power $P_1$ supplied by the source $v_S$.
Find the average power $P_2$ received by the 5 Ω resistor.
Find the average power $P_3$ received by the 4 Ω resistor.
Find the average power $P_4$ received by the capacitor.
Find the average power $P_5$ received by the inductor.




Given Variables:

. : . .

Calculate the following:

P1 (W) :

15 ✓

P2 (W) :

12.5 ✓

P3 (W) :

2.5 ✓

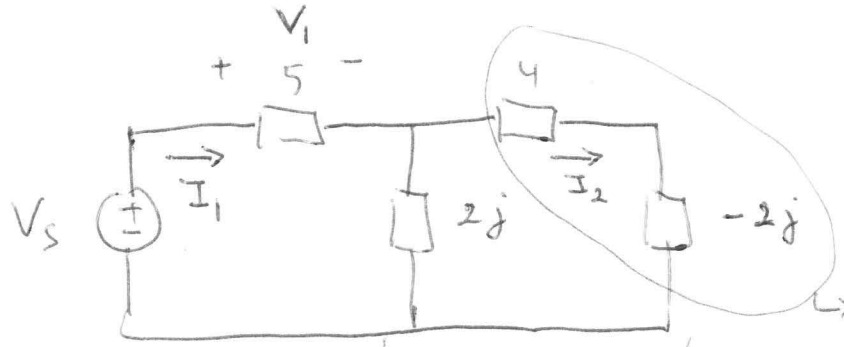
P4 (W) :

0 ✓

P5 (W) :

0 ✓

Hint: Find S first for each element. Keep Vs algebraic. Can you predict P for the cap and inductor? Check.




$\hookrightarrow Z_1 = 4-2j$

$$\hookrightarrow Z_2 = \frac{1}{\frac{1}{2j}+\frac{1}{4-2j}} = \frac{2j(4-2j)}{4-2j+2j} = j(2-j) = 1+2j$$

$$I_1 = \frac{V_s}{5+Z_2} = \frac{V_s}{6+2j}$$

① $S_1 = \frac{1}{2} V_s \cdot I_1^*$ (SUPPLIED!) $V_s \overset{+}{-} \uparrow I_1$

$= \frac{1}{2} V_s \frac{V_s^*}{6-2j} = \frac{|V_s|^2}{2} \cdot \frac{6+2j}{40} = \frac{100\cdot 2}{2}\left(\frac{6+2j}{40}\right)$ $\quad P_1 = Re[S_1]$

$\boxed{P_1 = 15\,W}$

② $S_2 = \frac{1}{2} V_1 I_1^* = \frac{1}{2} \cdot Z_{5\Omega} \cdot I_1 \cdot I_1^* = \frac{1}{2} Z_{5\Omega} |I_1|^2$

$S_2 = \frac{1}{2} \cdot 5 \cdot \frac{|V_s|^2}{|6+2j|^2} = \frac{5}{2} \cdot \frac{100\cdot 2}{40} = 12.5$ $\quad \boxed{P_2 = 12.5\,W}$

③ $I_2 = I_1 \cdot \frac{2j}{2j+Z_1} = I_1 \cdot \frac{2j}{2j+4-2j} = I_1 \frac{2j}{4} = I_1 \frac{j}{2}$

$S_3 = \frac{1}{2} Z_{4\Omega} |I_2|^2 = \frac{1}{2} \cdot 4 \cdot |I_1|^2 \cdot \frac{|j|^2}{4} = \frac{|I_1|^2}{2} = \frac{1}{2} \cdot \frac{|V_s|^2}{|6+2j|^2}$

$= \frac{1}{2} \cdot \frac{100\cdot 2}{40} = 2.5$ $\quad \boxed{P_3 = 2.5\,W}$

WE KNOW A CAPACITOR AND INDUCTOR ONLY HAVE REACTIVE POWER $\Rightarrow$ $\boxed{P_4 = P_5 = 0}$

CHECK: $P_{REC.} = P_{SUPPLIED} \Rightarrow 12.5 + 2.5 = 15$ OK