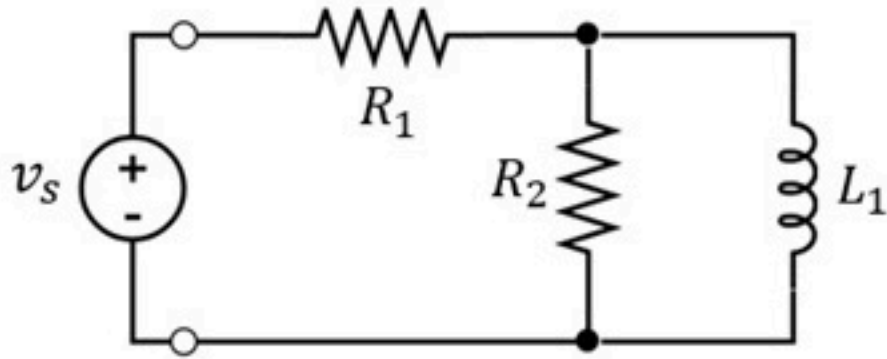$$v_s(t) = A_1 \cos(500t + B_1)$$

Find the complex power $\mathbf{S_1} = a_1 + b_1 j$ <u>received</u> by the source v_S.
Find the complex power $\mathbf{S_2} = a_2 + b_2 j$ <u>received</u> by the resistor R_1.
Find the complex power $\mathbf{S_3} = a_3 + b_3 j$ <u>received</u> by the resistor R_2.
Find the complex power $\mathbf{S_4} = a_4 + b_4 j$ <u>received</u> by the inductor L_1.

Given Variables:

A1 : 6 V
B1 : 45 degrees
R1 : 4 ohm
R2 : 4 ohm
L1 : 8 mH

Calculate the following:

a1 (W) :

-2.7 ✓

b1 (VAR) :

-0.9 ✓

a2 (W) :

1.8 ✓

b2 (VAR) :

0 ✓

a3 (W) :

0.9 ✓

b3 (VAR) :

0 ✓

a4 (W) :

0 ✓

b4 (VAR) :

0.9 ✓

$v_s(t) = A_1 \cos(500t + B_1)$

Find the complex power $S_1 = a_1 + b_1 j$ <u>received</u> by the source v_s.

Find the complex power $S_2 = a_2 + b_2 j$ <u>received</u> by the resistor R_1.

Find the complex power $S_3 = a_3 + b_3 j$ <u>received</u> by the resistor R_2.

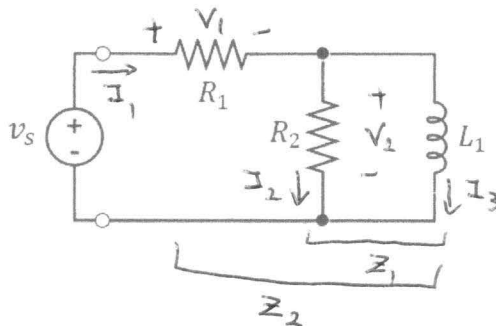Find the complex power $S_4 = a_4 + b_4 j$ <u>received</u> by the inductor L_1.

A1 : 3 V

B1 : 30 degrees

R1 : 1 ohm

R2 : 2 ohm

L1 : 4 mH

$Z_L = 2j$

$Z_1 = \dfrac{j}{\frac{1}{2} - \frac{j}{2}} = \dfrac{2}{1-j} = 1+j$

$Z_2 = Z_1 + 1 = 2 + j$

$V_s = 3e^{j30°}$

$I_1 = \dfrac{V_s}{Z_2}$

$V_1 = 1 \cdot I_1$

$V_2 = Z_1 I_1$

$I_2 = \dfrac{V_1}{2}$

$I_3 = \dfrac{V_1}{2j}$

(a) $S_1 = \frac{1}{2} V_s (-I_1^{*}) = -\frac{1}{2} \dfrac{V_s \cdot V_s^{*}}{Z_2^{*}} = -\dfrac{|V_s|^2}{2} \dfrac{Z_2}{|Z_2|^2} = -\dfrac{9}{2} \dfrac{(2+j)}{5}$

$\boxed{a_1 = -1.8 \text{ W}}$

$\boxed{b_1 = -0.9 \text{ VAR}}$

(b) $S_2 = \frac{1}{2} V_1 I_1^{*} = \dfrac{I_1 I_1^{*}}{2} = \dfrac{|I_1|^2}{2} = \dfrac{|V_s|^2}{2|Z_2|^2} = \dfrac{9}{2 \cdot 5}$

$\boxed{a_2 = 0.9 \text{ W}}$

$\boxed{b_2 = 0 \text{ VAR}}$

(c) $S_3 = \frac{1}{2} V_2 I_2^{*} = \frac{1}{2} V_2 \dfrac{V_2^{*}}{2} = \dfrac{|V_2|^2}{4} = \dfrac{|Z_1|^2 |I_1|^2}{4} = \dfrac{|Z_1|^2}{4} \dfrac{|V_s|^2}{|Z_2|^2} = \dfrac{2 \cdot 9}{4 \cdot 5}$

$\boxed{a_3 = 0.9 \text{ W}}$

$\boxed{b_3 = 0 \text{ VAR}}$

(d) $S_4 = \frac{1}{2} V_2 I_3^{*} = \frac{1}{2} V_2 \dfrac{V_2^{*}}{(2j)^{*}} = j \dfrac{|V_2|^2}{4} = j \dfrac{|Z_1|^2}{4} \dfrac{|V_s|^2}{|Z_2|^2} = j \dfrac{2 \cdot 9}{4 \cdot 5}$

$\boxed{a_4 = 0 \text{ W}}$

$\boxed{b_4 = 0.9 \text{ VAR}}$

CHECK : $S_1 + S_2 + S_3 + S_4 = \begin{matrix} -1.8 & +0.9 & +0.9 & +0 \\ -0.9j & +0j & +0j & +0.9j \end{matrix} = 0$

$\left(\sum \text{REC.} = \sum \text{SUPPL.} \right)$