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

Find the complex power $\mathbf{S_1} = a_1 + b_1 j$ received by the source v_S.

Find the complex power $\mathbf{S_2} = a_2 + b_2 j$ received by the resistor R_1.

Find the complex power $\mathbf{S_3} = a_3 + b_3 j$ received by the resistor R_2.

Find the complex power $\mathbf{S_4} = a_4 + b_4 j$ received by the inductor L_1.

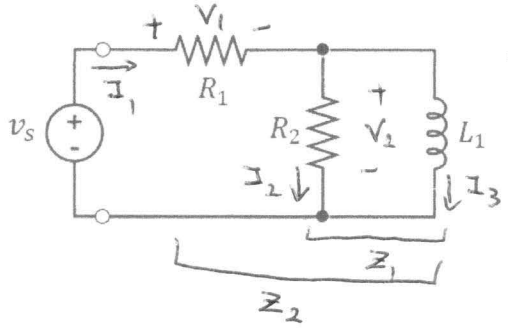
A1 : 3 V

B1 : 30 degrees

R1 : 1 ohm

R2 : 2 ohm

L1 : 4 mH



$Z_L = 2j$

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

$Z_2 = Z_1 + 1 = 2 + j$

$V_S = 3 e^{j30^\circ}$ $\quad I_1 = \dfrac{V_S}{Z_2}$ $\quad V_1 = 1 \cdot I_1$ $\quad V_2 = Z_1 I_1$

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

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

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

$a_1 = -1.8\,W$

$b_1 = -0.9\,VAR$

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

$a_2 = 0.9\,W$

$b_2 = 0\,VAR$

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

$a_3 = 0.9\,W$

$b_3 = 0\,VAR$

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

$a_4 = 0\,W$

$b_4 = 0.9\,VAR$

CHECK: $S_1 + S_2 + S_3 + S_4 = (-1.8 + 0.9 + 0.9 + 0) + (-0.9j + 0j + 0j + 0.9j) = 0$

(Σ REC. $= \Sigma$ SUPPL.)