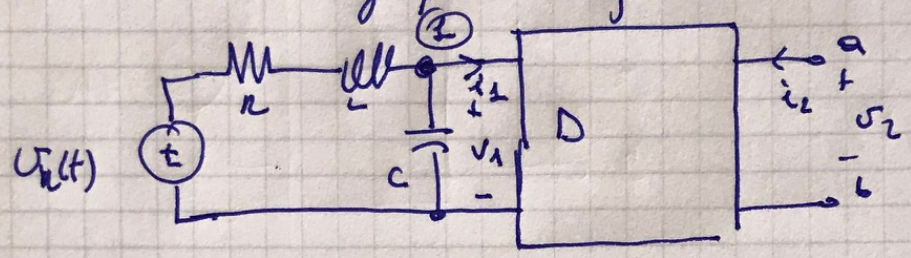
In figure, $R = 1\,\Omega$, $L = 1H$, $C = 1F$ and $v_k(t) = 2\cos t$.

2-port network D is defined by $i_1 = -2i_2$ and $v_2 = 2v_1$.

a) Obtain Thevenin equivalent circuit (in ω-domain) with respect to the terminal a and b.

b) What impedance should be connected across the terminal a-b for maximum average power transfer.



a)

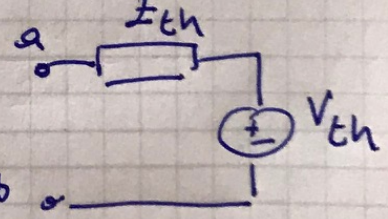
(1) $$\frac{1}{R+j\omega L}(V_1 - V_k) + j\omega C V_1 + I_1 = 0$$

$$I_1 = -2I_2 \quad , \quad V_1 = \frac{1}{2}V_2$$

$$\frac{1}{2}\left(j\omega C + \frac{1}{R+j\omega L}\right)V_2 - 2I_2 - \frac{1}{R+j\omega L}V_k = 0$$

$V_k = 2\angle 0^\circ \quad \omega = 1$

$$V_2 = \underbrace{(4-4j)}_{Z_{th}}\, I_2 \underbrace{-4j}_{V_{th}}$$



(2) $$Z_L = \overline{Z_{th}} = 4+4j = R_L + j\omega L_L$$

R_L: $4\,\Omega$; L_L: $4H$