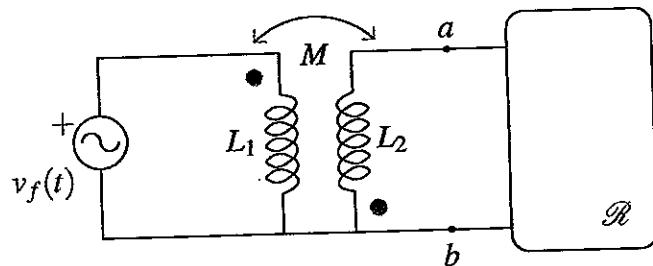


Problema 12.1 En la red de la figura, $v_f(t) = A \cos(\omega t)$. Determine la red equivalente Thévenin desde los terminales $a-b$



$v_T(t)$: Calculamos el voltaje de circuito abierto

$$\begin{aligned}
 & \text{Circuit diagram:} \\
 & \text{Left: } v_f(t) \text{ source, } i_1 \text{ current through } L_1, \text{ voltage } v_1 \text{ across } L_1. \\
 & \text{Middle: Mutual inductor } M \text{ with } i_1 \text{ entering top terminal, } i_2 \text{ entering bottom terminal.} \\
 & \text{Right: } v_2 = v_T \text{ voltage across } L_2, \text{ current } i_2 \text{ through } L_2. \\
 & \text{Equations:} \\
 & v_1 = v_f = L_1 \frac{di_1}{dt} - M \frac{di_2}{dt} \quad (1) \\
 & v_2 = L_2 \frac{di_2}{dt} - M \frac{di_1}{dt} \quad (2) \\
 & i_2 = 0 \quad (\text{since } v_2 = v_T \text{ and } i_2 \text{ is zero})
 \end{aligned}$$

Por tanto,

$$v_f = L_1 \frac{di_1}{dt}$$

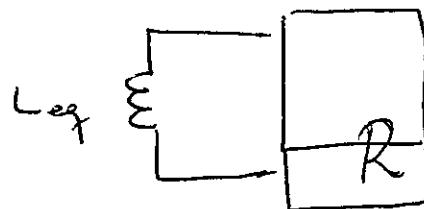
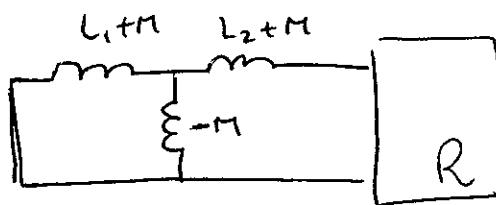
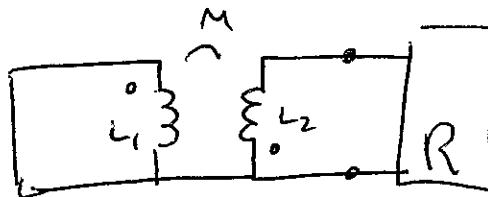
$$v_2 = -M \frac{di_1}{dt}$$

~~$$v_2 = v_T$$~~

$$\Rightarrow v_2 = v_T = -\frac{M}{L_1} v_f = -\frac{M}{L_1} A \cos(\omega t)$$

Reducción

Se red Thévenin se obtiene apagando las fuentes



$$L_{eq} = (L_1 + M) // (-M) + L_2 + M$$

$$= \frac{(L_1 + M)(-M)}{L_1} + L_2 + M$$

$$= \frac{-L_1 M - M^2 + L_1 L_2 + L_1 M}{L_1} = L_2 (1 - k^2)$$

en que $k = \frac{M}{\sqrt{L_1 L_2}}$

Por tanto, el equivalente Thévenin es:

