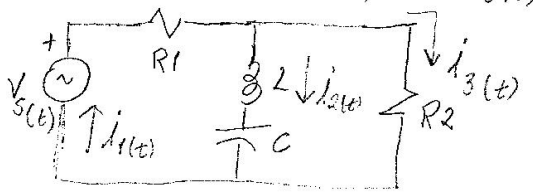
EJERCICIOS:

OBTENGA LA ECUACIÓN DIFERENCIAL QUE RELACIONE $V_{S(t)}$ Y $i_{3(t)}$



a) ECUACIONES:

1) $-V_{S(t)} + R_1 i_{1(t)} + R_2 i_{3(t)} = 0$

2) $-\frac{1}{C}\int i_{2(t)} - L\frac{d}{dt} i_{2(t)} + R_2 i_{3(t)} = 0$

3) $i_{1(t)} = i_{2(t)} + i_{3(t)}$

SUST. (3) EN (1)

$$-V_{S(t)} + R_1\left(i_{2(t)} + i_{3(t)}\right) + R_2 i_{3(t)} = 0 \Rightarrow$$

$$\Rightarrow i_{2(t)} = \frac{V_{S(t)}}{R_1} - \frac{(R_1+R_2)}{R_1}\cdot i_{3(t)}$$

SUST EN (2)

$$-\frac{1}{C}\int\left[\frac{V_{S(t)}}{R_1} - \frac{R_1+R_2}{R_1} i_{3(t)}\right]dt + \dots$$

$$-L\frac{d}{dt}\left\{\frac{V_{S(t)}}{R_1} - \frac{R_1+R_2}{R_1} i_{3(t)}\right\} + R_2 i_{3(t)} = 0$$

DERIVANDO Y REORDENANDO:

$$-\frac{V_{S(t)}}{R_1 C} + \frac{R_1+R_2}{CR_1} i_{3(t)} - \frac{L}{R_1}\frac{d^2}{dt^2} V_{S(t)} + \dots$$

$$+\frac{L\cdot(R_1+R_2)}{R_1}\frac{d^2}{dt^2} i_{3(t)} + R_2 i_{3(t)} = 0$$

ENTONCES:

$$\frac{d^2}{dt^2} i_{3(t)} + \left\{\frac{1}{CL} + \frac{R_2\cdot R_1}{C(R_1+R_2)}\right\} i_{3(t)} = \frac{1}{R_1+R_2}\frac{d}{dt} V_{S(t)} + \frac{V_{S(t)}}{LC(R_1+R_2)}$$