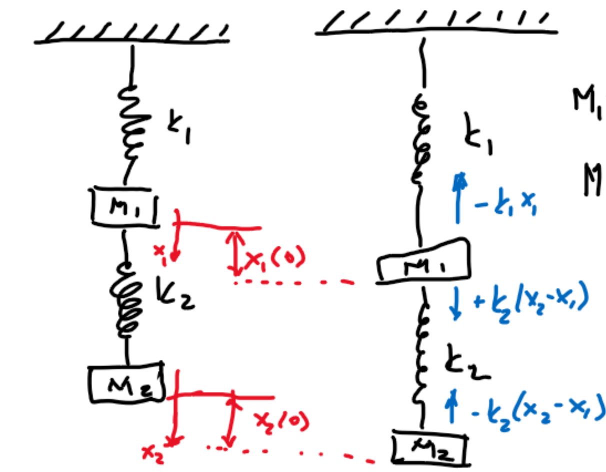
Clase del 25 Noviembre 2021.

Problema de 2 resortes acoplados



$$M_1 \cdot \frac{d^2x_1(t)}{dt^2} = -k_1 x_1(t) + k_2(x_2(t) - x_1(t))$$

$$M_2 \frac{d^2x_2(t)}{dt^2} = -k_2(x_2(t) - x_1(t))$$

$x_2(0) \qquad Dx_2(0) = 0$

$x_1(0) \qquad Dx_1(0) = 0$

$$\frac{d^2x_1(t)}{dt^2} = -\frac{(k_1+k_2)}{M_1} x_1(t) + \frac{k_2}{M_1} x_2(t)$$

$$\frac{d^2x_2(t)}{dt^2} = \frac{k_2}{M_2} x_1(t) - \frac{k_2}{M_2} x_2(t)$$

$$\left[\begin{aligned} \frac{dx_1(t)}{dt} &= x_3(t) \\ \frac{dx_2(t)}{dt} &= x_4(t) \\ \frac{dx_3(t)}{dt} &= -\frac{(k_1+k_2)}{M_1} x_1(t) + \frac{k_2}{M_1} x_2(t) \\ \frac{dx_4(t)}{dt} &= \frac{k_2}{M_2} x_1(t) - \frac{k_2}{M_2} x_2(t) \end{aligned}\right]$$

$x_1(0) = \frac{4}{6} \cdot \frac{1}{10}$

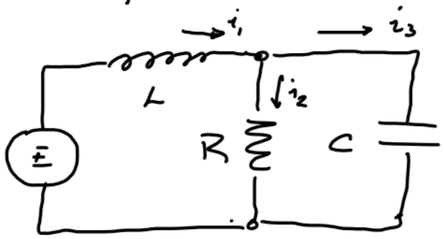
$x_2(0) = \frac{1}{10}$

$x_3(0) = 0$

$x_4(0) = 0$

$M_1 = 1 \quad M_2 = 1 \quad k_1 = 6 \quad k_2 = 4$

Ejercicio 2.



$i_1 = i_2 + i_3$

$$L\frac{di_1(t)}{dt} + Ri_2(t) = E(t)$$

$$RC\frac{di_2(t)}{dt} + i_2(t) - i_1(t) = 0$$

$E(t) = 60\ V$

$L = 1\ h$

$R = 50\ ohm$

$C = 10^{-4}\ f$

$$\boxed{\begin{gathered}\frac{di_1(t)}{dt} + 50 i_1(t) = 60 \\ 50(10^{-4})\frac{di_2(t)}{dt} + i_2(t) - i_1(t) = 0 \\ i_1(0) = 0 \qquad i_2(0) = 0\end{gathered}}$$

TEMA 4 - la ED en DP

$$F\left(x, y, z(x,y), \frac{\partial z}{\partial x}, \frac{\partial z}{\partial y}, \frac{\partial^2 z}{\partial x \partial y}, \dots\right) = 0$$

a) orden $\longrightarrow$ lo marca la derivada mayor orden.

b) Pueden existir más de una Solución General.

c) no existen métodos únicos para resolverlas

d) Serie trigonométrica de FOURIER para obtener la solución particular dadas condiciones iniciales y/o frontera

I.- MÉTODO DE COEFICIENTES Y ECUA. CARACT

II.- MÉTODO DE SEPARACIÓN DE VARIABLES.

(DE PRUEBA Y ERROR) $\longrightarrow$

ED en DP $\longrightarrow$ SIST. EDO.

el parámetro alfa $\quad \alpha \begin{cases} = 0 \\ > 0 \\ < 0 \end{cases}$

$$\frac{\partial^2 z}{\partial x^2} + \frac{\partial z}{\partial y} = z$$

$$z = F(x) \cdot G(y)$$

$$\frac{\partial z}{\partial y} = F \cdot G' \qquad \frac{\partial z}{\partial x} = F' G \qquad \frac{\partial^2 z}{\partial x^2} = F'' G$$

$$F''G + FG' = FG$$

$$F''G = FG - FG'$$

$$F''G = F(G - G')$$

$$\frac{F''}{F} = \frac{G - G'}{G} \qquad \frac{F''}{F} = \alpha$$

$$\frac{G - G'}{G} = \alpha$$

para $\alpha = 0$

$$F'' = 0 \qquad F' = C_1 \qquad F(x) = C_1 x + C_2$$

$$G' = G \qquad G(y) = C_1 e^{+y}$$

$$\underset{\alpha=0}{z(x,y)} = e^{y}(C_1 x + C_2)$$

para $\alpha > 0$ $\quad \alpha = \beta^2$

$$\frac{F''}{F} = \beta^2 \qquad F'' - \beta^2 F = 0 \qquad m^2 - \beta^2 = 0$$

$$(m+\beta)(m-\beta) = 0$$

$$F(x) = C_1 e^{-\beta x} + C_2 e^{\beta x}$$

$$\frac{G - G'}{G} = \beta^2 \qquad G - G' = \beta^2 G$$

$$G' = G - \beta^2 G$$

$$G' + (\beta^2 - 1) G = 0$$

$$G(y) = C e^{(1-\beta^2)y}$$

$$\underset{\alpha>0}{z(x,y)} = e^{(1-\beta^2)y}\left(C_1 e^{-\beta x} + C_2 e^{\beta x}\right)$$

para $\alpha < 0$ $\quad \alpha = -\beta^2$

$$\frac{F''}{F} = -\beta^2 \qquad F'' + \beta^2 F = 0 \qquad m^2 + \beta^2 = 0$$

$$m = \pm \beta i$$

$$F(x) = C_1 \cos(\beta x) + C_2 \operatorname{sen}(\beta x)$$

$$\frac{G - G'}{G} = -\beta^2 \qquad G - G' = -\beta^2 G$$

$$G + \beta^2 G = G'$$

$$G' - (1 + \beta^2) G = 0$$

$$G(y) = C e^{(\beta^2 + 1) y}$$

$$\underset{\alpha<0}{Z(x,y)} = e^{(\beta^2+1)y}\left(C_1 \cos(\beta x) + C_2 \operatorname{sen}(\beta x)\right).$$