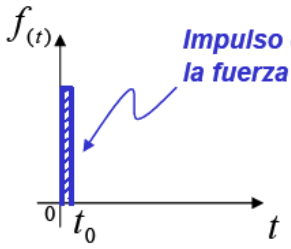
## Excitación Impulso




$$\hat{f} = \int_0^{t_0} f_{(t)}\, dt$$

Cond. iniciales no nulas:

$$x_{(0)} = x_0 \qquad \dot{x}_{(0)} = \frac{\hat{f}}{m} + v_0$$

$$x_{(t)} = \underbrace{\hat{f}\, h_{(t)}}_{\text{Resp. debida al impulso}} + \underbrace{e^{-\zeta\omega_n t}\left[x_0 Cos(\omega_d t) + \frac{v_0 + \zeta\omega_n x_0}{\omega_d} Sen(\omega_d t)\right]}_{\text{Resp. debida a las condiciones iniciales}} \qquad t > t_0$$

Cond. Iniciales nulas

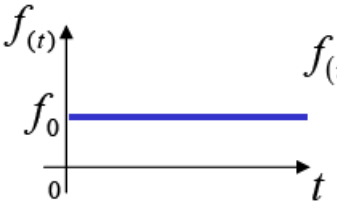
$$x_{(t=0)} = \dot{x}_{(t=0)} = 0$$

$$x_{(t)} = \hat{f}\, h_{(t)} \qquad t > t_0$$

Donde; $$h_{(t)} = \frac{1}{m\omega_d} e^{-\zeta\omega_n t} Sen(\omega_d t)$$

## Escalón infinito

(cond. iniciales son nulas)



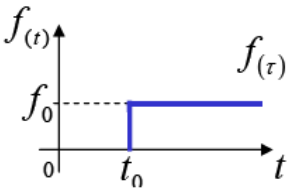

$$f_{(\tau)} = f_0 \qquad \tau > 0$$

$$x_{(t)} = \frac{f_0}{k}\left[1 - e^{-\zeta\omega_n t}\left(Cos(\omega_d t) + \frac{\zeta}{\sqrt{1-\zeta^2}} Sen(\omega_d t)\right)\right]$$

$$\zeta = 0 \quad \Rightarrow \quad x_{(t)} = \frac{f_0}{k}\left[1 - Cos(\omega_n t)\right]$$

## Escalón infinito desplazado

(cond. iniciales son nulas)



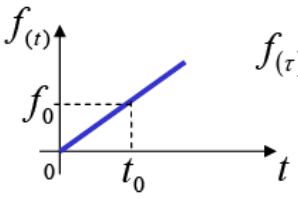

$$f_{(\tau)} = \begin{cases} 0 & 0 < \tau \le t_0 \\ f_0 & \tau > t_0 \end{cases}$$

$$x_{(t)} = \frac{f_0}{k}\left[1 - e^{-\zeta\omega_n(t-t_0)}\left(Cos(\omega_d(t-t_0)) + \frac{\zeta}{\sqrt{1-\zeta^2}}Sen(\omega_d(t-t_0))\right)\right]$$

$$\zeta = 0 \quad \Rightarrow \quad x_{(t)} = \frac{f_0}{k}\left[1 - Cos(\omega_n(t-t_0))\right]$$

## Rampa infinita

(cond. iniciales son nulas)



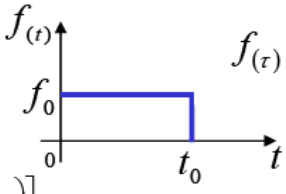

$$f_{(\tau)} = \frac{f_0}{t_0}\tau \quad \tau > 0$$

$$x_{(t)} = \frac{f_0}{k\,t_0\omega_n}\left[-2\zeta + \omega_n t + e^{-\zeta\omega_n t}\left(2\zeta\,Cos(\omega_d t) + \frac{\omega_n}{\omega_d}(2\zeta^2 - 1)Sen(\omega_d t)\right)\right]$$

$$\zeta = 0 \quad \Leftarrow \quad x_{(t)} = \frac{f_0}{k\,t_0\omega_n}\left[\omega_n t - Sen(\omega_n t)\right]$$

## Escalón finito

(cond. iniciales son nulas)




$$f_{(\tau)} = \begin{cases} f_0 & 0 < \tau \le t_0 \\ 0 & \tau > t_0 \end{cases}$$

$$x_{(t)} = \frac{f_0}{k}\left[1 - e^{-\zeta\omega_n t}\left(Cos(\omega_d t) + \frac{\zeta}{\sqrt{1-\zeta^2}}Sen(\omega_d t)\right)\right] \qquad 0 < t \le t_0$$

$$x_{(t)} = \frac{f_0}{k}\left[e^{-\zeta\omega_n(t-t_0)}\left(Cos(\omega_d(t-t_0)) + \frac{\zeta}{\sqrt{1-\zeta^2}}Sen(\omega_d(t-t_0))\right) - e^{-\zeta\omega_n t}\left(Cos(\omega_d t) + \frac{\zeta}{\sqrt{1-\zeta^2}}Sen(\omega_d t)\right)\right] \qquad t > 0$$

$$x_{(t)} = \frac{f_0}{k}\left[1 - Cos(\omega_n t)\right] \qquad 0 < t \le t_0$$

$$x_{(t)} = \frac{f_0}{k}\left[Cos(\omega_n(t-t_0)) - Cos(\omega_n t)\right] \qquad t > 0$$

$$\Rightarrow \quad \zeta = 0$$