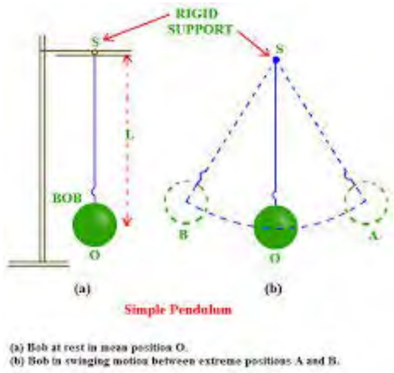
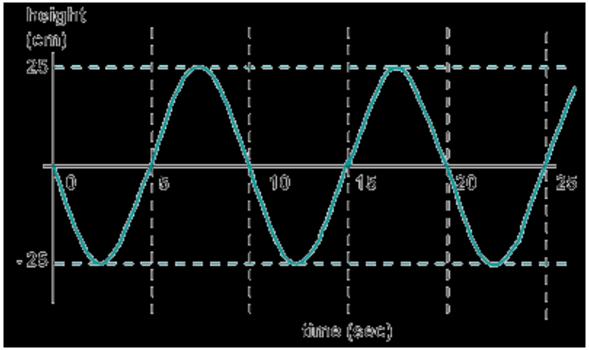
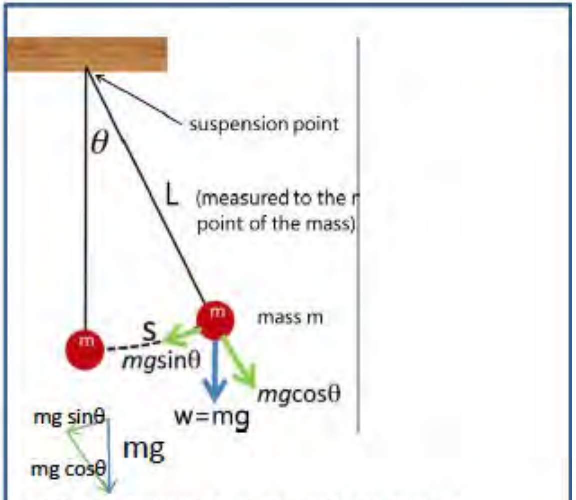






Eq del moto tangenziale (a ds piccole oscillazioni):

$$ml\left(\frac{d^2\theta}{dt^2}\right)=mg\sin\theta \longrightarrow ml\left(\frac{d^2\theta}{dt^2}\right)=mg\theta$$

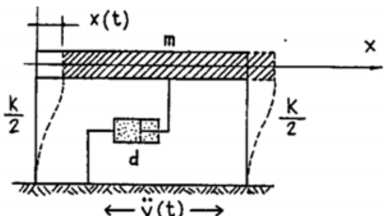
$$\longrightarrow \frac{d^2\theta}{dt^2}=\frac{g}{l}\theta \qquad \ddot{\theta}+\frac{g}{l}\theta=0 \qquad \theta(t)=\theta_{max}\cos\left(\sqrt{\frac{g}{l}}t+\phi_0\right)$$

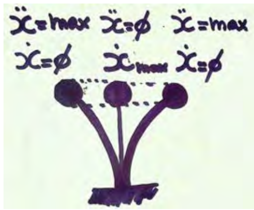
Il tempo tra due massimi è indipendente dall'ampiezza:

$$T=2\pi(L/g)^{0.5}$$

Nelle strutture elastiche analogamente:

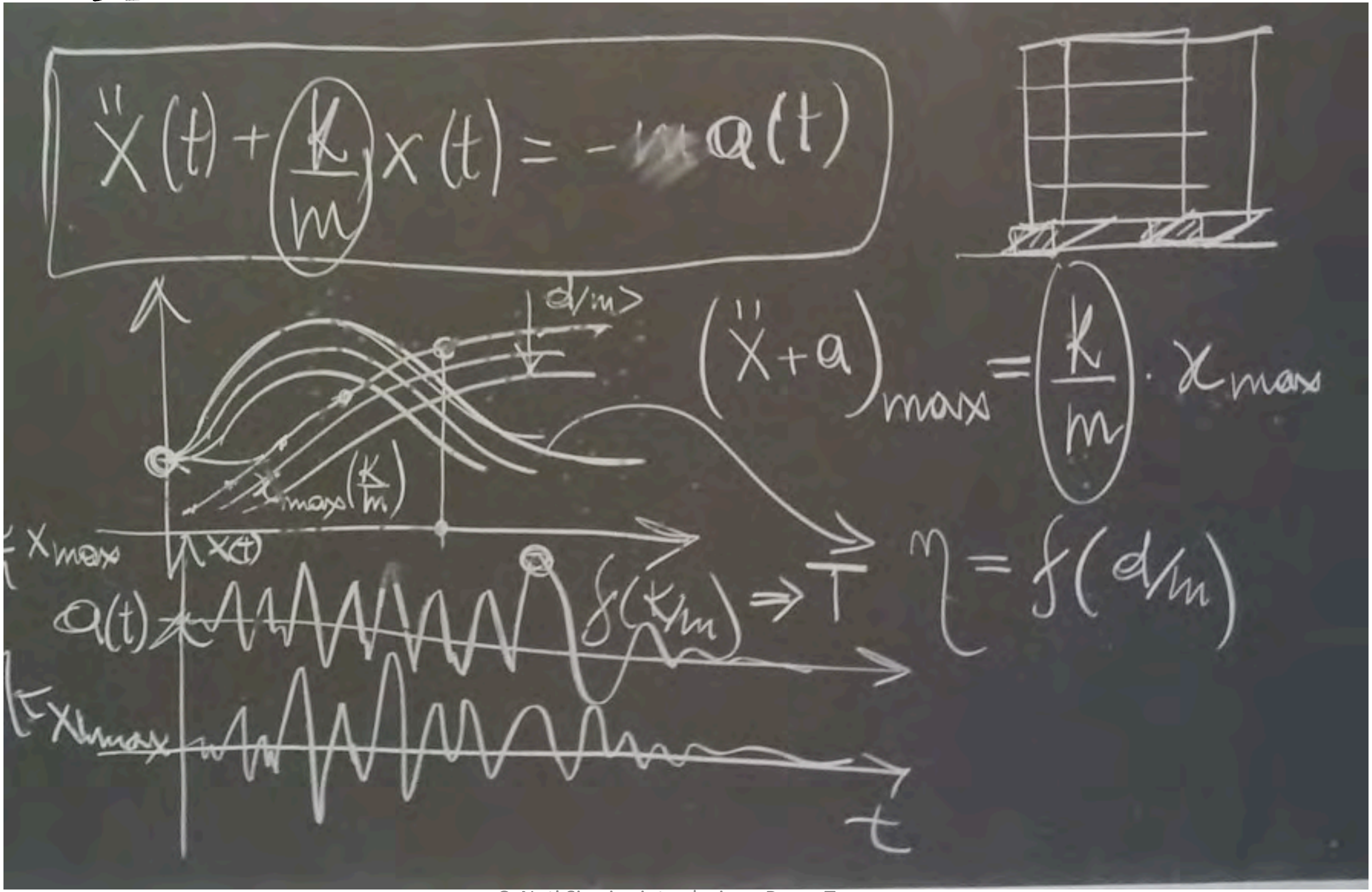
$$T=2\pi(m/k)^{0.5}$$



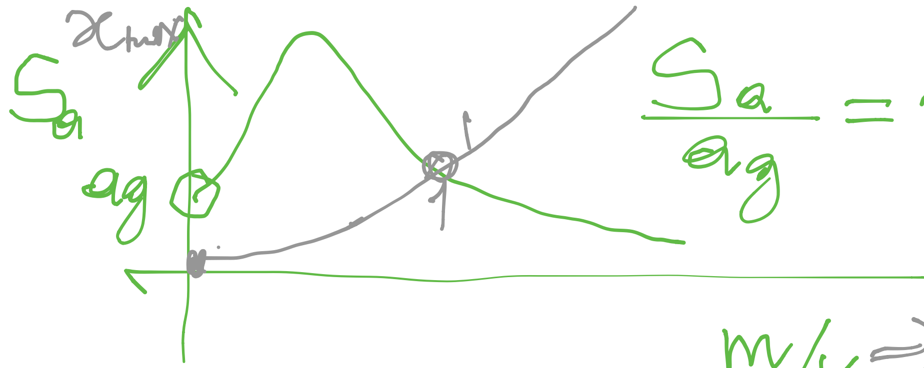


$$x(t) = A \sin \omega t + B \cos \omega t \qquad \Big| \; \omega^2 = \frac{k}{m}$$

$$\dot{x} = A\omega \cos \omega t - B\omega \sin \omega t$$



$$x(t=0) = x_0 = 0 + B$$



$$\frac{S_a}{a_g} = 1$$

$$m/K \Rightarrow 2\pi\sqrt{\frac{m}{K}}$$

$$x_{max} = \frac{m}{K}\left(S_a\right)$$

$$S_a = \ddot{y}_{max} + \ddot{x}_{max}$$

$$\ddot{x} + \underbrace{\boxed{2\nu\omega\dot{x}}}_{=\emptyset} + \omega^2 x = -\ddot{y}$$

$$\ddot{x}(t) \Rightarrow \boxed{x(t) = A\sin\omega t + B\cos\omega t}$$

$$\dot{x}(t) = +A\omega\cos(\omega t) - B\omega\sin(\omega t)$$

$$\ddot{x}(t) = -A\omega^2\sin(\omega t) - B\omega^2\cos(\omega t)$$

$$\ddot{x}(t) = -\omega^2\left(A\sin\omega t + B\cos\omega t\right)$$

$$\ddot{x}(t) = -\omega^2 x(t)$$

$$x(t=0) = x_0 \,\big|\, x(t=0) = \cancel{A\sin(\omega\emptyset)} + B\cos\omega\emptyset$$

$$x(t) = \frac{\dot{x}_0}{\omega}\sin\omega t + x_0\cos\omega t$$

$\dot{x}(t=0) = \emptyset = A\omega + \emptyset$ | $x(t) = x_0 \cos\omega t$

$x(t) = x_0 \cos\sqrt{\frac{k}{m}}\, t$

Esercizio: calcolo periodo proprio

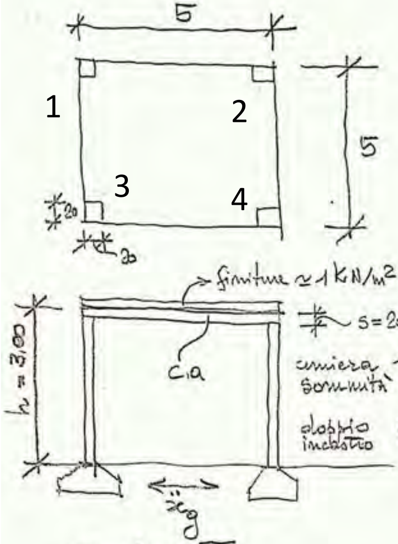
$\sqrt{\frac{k}{m}}\, t = 2\pi$

$T = 2\pi\sqrt{\frac{m}{k}}$

Caso 1) pil 20x20

Caso 2) pil 1 e 2 20x20; 3 e 4 30x30

Calcolare periodo proprio



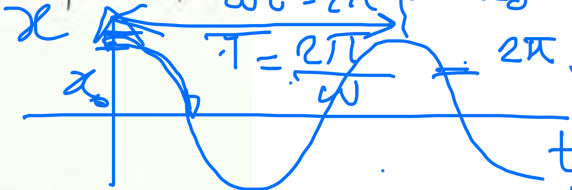
cerniera sommità 1) $K_1 = \frac{3EI}{h^3}$

doppio incastro 2) $K_2 = \frac{12EI}{h^3}$

$T = 2\pi\sqrt{\frac{M}{K}}$

$\omega t = 2\pi$ $\quad x = x_0 \cos\omega t$

$T = \frac{2\pi}{\omega} = 2\pi\sqrt{\frac{m}{k}}$



$m = 0{,}2 \times 2{,}5 = 0{,}5$ t/m²

$M = 15$ t

$k = 3EI/h^3$

$k = \frac{10}{5\times10^{-3}} = 2\times10^3$ N/m

$m = 4$ kg

m → kg

$F = k \cdot$

$T = 6{,}28\left(\frac{4}{2\times10^3}\right)^{0,5}$

$= 6{,}28 \times \left(\frac{2}{1000}\right)^{0,5} = \frac{6{,}28 \times 1{,}41}{30} = 8/30$

Spost. rel. alla base $\quad$ spost. base

$M\ddot{u}(t)$ forza di inerzia : $u = x + x_g$

$d\dot{x}(t)$ forza dissipativa

$Kx(t)$ forza elastica di richiamo

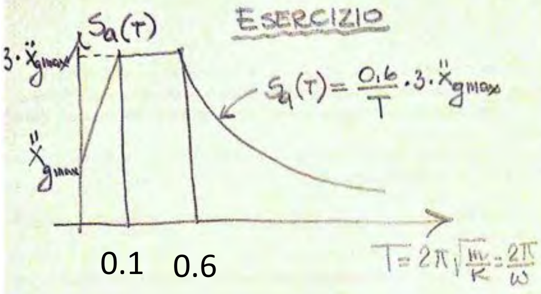
$2\xi\omega$ $\quad \omega^2$

$\cancel{m}\ddot{x} + d\dot{x} + Kx = -\cancel{m}\, a(t)$

Esercizio: Uso dello spettro di risposta, calcolo della risposta

$$\frac{m}{K} \simeq \frac{15}{1780} = 0{,}0084$$

$$T \cong 0{,}576\ s$$



$\ddot{x}_{gmax} = 2.0\ m/s^2$ Municipio I – VI

$\ddot{x}_{gmax} = 1{,}5\ m/s^2$ Municipio VII – XX

$\ddot{x}_{gmax} = 2{,}5\ m/s^2$ fuori Roma.

trovare per la struttura dell'autorimessa

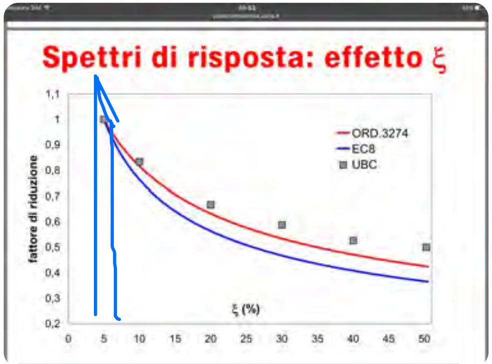
S_a

X_{max}

F_{max}

M_{max} (mom. massimo) alla base

T_{max} (taglio massimo)



normative

•ORD. 3274

$$\eta = \sqrt{\frac{10}{(5+\xi)}}$$ η= 1 per ξ = 5

•EC8

$$\eta = (7/(2+\xi))^{1/2}$$ η= 1 per ξ = 5

•UBC

ξ	< 2	5	10	20	30	40	> 50
B=1/η	0.08	1	1,2	1,5	1,7	1,9	2

• Fare esercizio per sisma Roma h = 2,50/3,00 [illegible] incastro [illegible] sul blog