Rayleigh-damping-coefficients

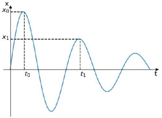
Determination of the damping ratio from the logarithmic decay

$$\zeta = \frac{\delta}{\sqrt{\delta^2 + (2\pi)^2}}$$

$$\delta = \ln \frac{x_0}{x_1}$$

$$f = \frac{1}{T} = \frac{1}{t_1 - t_0}$$

$$\omega = 2\pi f$$



Percentage of loss in Ampplitude in one Cycle.	10%
X0/X1	1.11
δ	0.1054
ζ1	0.01677

START HERE

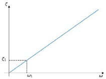
Green Color for Input Window
Color for important parameter

Damping proportional to the stiffness. α=0

It is then most common to assume the case of damping proportional to the stiffness, that is, α=0, and the β stiffness coefficient is computed from:

$$\beta = \frac{2\zeta_1}{\omega_1} = \frac{\zeta_1}{\pi f_1}$$

ω1	2	[Rad/s]
β	0.0168	[s]
α	0.0000	[Rad/s]



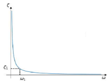
Check Mecway/ccx			
Displacement	X0	50	mm
Displacement	X1	44.9943	mm
Percentage of loss in Ampplitude in one Cycle w1.	10.01%		
Error	0.11%		

Damping proportional to the inertia. β=0

If the knowledge on the system indicates the case of damping decreasing with the frequency, then one can assume the case of damping proportional to the inertia, where β=0 and determine the mass coefficient α

$$\alpha = 2\zeta_1\omega_1 = 4\pi\zeta_1 f_1$$

ω1	50	[Rad/s]
β	0.0000	[s]
α	1.6766	[Rad/s]

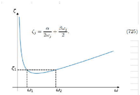


Check Mecway/ccx			
Displacement	X0	50	mm
Displacement	X1	44.9739	mm
Percentage of loss in Ampplitude in one Cycle w1.	10.05%		
Error	0.52%		

Mixture of both

$$\alpha = \frac{2\omega_1\omega_2(\zeta_2\omega_1 - \zeta_1\omega_2)}{\omega_1^2 - \omega_2^2} \qquad \beta = \frac{2(\zeta_1\omega_1 - \zeta_2\omega_2)}{\omega_1^2 - \omega_2^2}$$

ω1	70	[Rad/s]
ω2	80	[Rad/s]
ζ1	0.0168	
ζ2=ζ1	0.0168	
α	1.2519	[s]
β	0.0002	[Rad/s]



Check Mecway/ccx			
Displacement	X0	50	mm
Displacement w1	X1 (w1)	44.9923	mm
Displacement w2	X1 (w2)	44.9739	mm
Percentage of loss in Ampplitude in one Cycle w1.	10.02%		
Percentage of loss in Ampplitude in one Cycle w2.	10.05%		
Largest Error	0.52%		