Temperature of the control of the co	Vibration Is Imports from math import * from scipy.optimize	e import newton				
maga = freq*2*pi TR = max_1*f*f*/max TR = max_1*f*/max TR = max_1*f*/	Problem Dat M = 1200.000 f_max = 400 freq = 20.0 # max of Transmitte max_tf = 150	a ed Force				
print(fetX('Tensmissisbility Ratio, TR', TR', '')) Machine Mass = 1280,0000000 kg	<pre>omega = freq*2*pi TR = max_tf/f_max fmt = '%30s = %f %s print(fmt%('Machine print(fmt%('Unbalar print(fmt%('Force\' print(fmt%('Circula</pre>	s' e Mass', M, 'kg')) nced Force', f_max, 'N 's Frequency', freq, ' ar Frequency', omega,	Hz')) 'rad/s'))			
Undamped Case # undamped, TR = 1/(6²-1) = 6² TR = 1+TR = 6² = (1+TR)/TR # 0² = ω²/(K/M) = K = u²M/6² = ω²M TM/(1+TR) beta2_und = (1+TR)/TR K_und = onega-fonega****TK/(1+TR) print(fmtX("B* undamped", beta2_und, '(rad/s)²')) print(fmtX("B* undamped", beta2_und, '(rad/s)²')) print(fmtX("Suspension Stiffness', K_und/165, 'kN/mm')) Damped Case z = 0.12 # damped, TR = sqrt(1+42²6²)/sqrt((1-6²)²+42²6²) - TR² = 0 f = lambda b2: (1+4½²²²)/2(1/(1-6²)²+24²6²) - TR² = 0 f = lambda b2: (1+4½²²²²)/2(1/(1-6²)²+24²6²) - TR² = 0 f = lambda b2: (1+4½²²²²)/2(1/(1-6²)²+24²6²) - TR² = 0 f = lambda b2: (1+4½²²²)/2 und K_dam = '2**sqrt("K, dam) print(fmtX("B' damped', beta2_dam, '(rad/s)²)) print(fmtX("B' damped', beta2_dam, '(rad/s)²)) print(fmtX("Suspension Stiffness', K_dam/165, 'kN/mm')) print(fmtX("Suspension Damping = 18.294386 N/(mm/s)) Dissipated Energy The dissipated energy per cycle is 0 when the system is undamped, it is equal (see the margin figure) to \(\pi \times	<pre>print(fmt%('Circula print(fmt%('Max Tra print(fmt%('Transmi</pre>	ar Frequency', omega, ansmitted Force', max_ issibility Ratio, TR', Machine Mass = 1200 alanced Force = 400 e's Frequency = 20.0 lar Frequency = 125	'rad/s')) tf, 'N')) TR, '')) 0.000000 kg 000000 N 000000 Hz 0663706 rad/s			
K_und = omega*omega*M*TR/(1-TR) print(fmtX('Suspension Stiffness', K_und/1E6, 'kN/mm')) print(fmtX('Suspension Stiffness', K_und/1E6, 'kN/mm')) print(fmtX('Suspension Stiffness', K_und/1E6, 'kN/mm')) β² undamped = 3.6666667 (rad/s)² Suspension Stiffness = 5.168084 kN/mm Suspension Damping = 0.000000 N/(mm/s) Damped Case z = 0.12 # domed, TR = sqrt(1+42*0²)/sqrt((1-0²)²+42*0²) → # - (1+42*0²)/((1-0²)²+42*0²) - TR² = 0 f = lambda b2: (1+4*2**2*2*b2)/((1-0²)²+42*0²) - TR**2 beta²_dam = newton(f, beta²_dam dam = ?*2**Sgrt(M*K_dam) K_dam = N*omega**2/beta²_dam dam = ?*2**Sgrt(M*K_dam) print(fmtX('Suspension Stiffness', K_dam/1E6, 'kN/mm')) print(fmtX('Suspension Stiffness', K_dam/1E6, 'kN/mm')) print(fmtX('Suspension Stiffness = 4.842080 kN/mm Suspension Stiffness = 4.842080 kN/mm Suspension Damping = 18.294386 N/(mm/s) Dissipated Energy The dissipated energy per cycle is 0 when the system is undamped, it is equal (see the margin figure) to π × x**max × fn** for the damped system. b2 = beta²_dam K = K_dam dyn_amp_fac = 1/sqrt((1-b2)**2+4*z**2*b2) x_max = f_max/K_dam	Transmissibil Undamped (# undamped, TR = 1/ # 6² = w² beta2_und = (1+TR)/	ity Ratio, TR = 0.37 Case $ \frac{f(\theta^2-1)}{f(\theta^2-1)} \Rightarrow \theta^2 TR = 1+TR $ $ \frac{f'(R/M)}{f(R/M)} \Rightarrow K = \omega^2 M/\theta^2 = 0$ TR	75000 $R \Rightarrow 6^2 = (1+TR)/TR$			
Damped Case	<pre>K_und = omega*omega print(fmt%('β² unda print(fmt%('Suspens print(fmt%('Suspens Suspens</pre>	a*M*TR/(1+TR) amped', beta2_und, '(r sion Stiffness', K_und sion Damping', 0.0, 'N β² undamped = 3.66 ion Stiffness = 5.16	//1E6, 'kN/mm')) //(mm/s)')) 56667 (rad/s) ² 58084 kN/mm			
<pre>K_dam = M*omega**2/peta2_dam dam = 2*z*sqrt(M*_dam) print(fmt%('P3 damped', beta2_dam, '(rad/s)²')) print(fmt%('Suspension Stiffness', K_dam/1E6, 'kN/mm')) print(fmt%('Suspension Damping', dam/1E3, 'N/(mm/s)'))</pre>	Damped Cas z = 0.12 # damped, TR = sqrt f = lambda b2: (1+4 beta2_dam = newton(e $t(1+4\zeta^2\theta^2)/sqrt((1-\theta^2))$ $t(1+4\zeta^2\theta^2)/((1-\theta^2)^2+4)$ $t(1+4\zeta^2\theta^2)/((1-b^2)^2+4)$ $t(1+2z^2+2z^2+4)$ $t(1+2z^2+4)$	² +4ζ ² β ²) ⇒ Ιζ ² β ²) - TR ² = 0			
Dissipated Energy The dissipated energy per cycle is 0 when the system is undamped, it is equal (see the margin figure) to $\pi \times x_{\max} \times f_{I}$ for the damped system. $b2 = beta2_dam$ $K = K_dam$ $dyn_amp_fac = 1/sqrt((1-b2)**2+4*z**2*b2)$ $x_max = f_max/K_dam * dyn_amp_fac$ $v_max = x_max * omega$ $f_dmax = v_max * dam$ $print(' Max s-s displacement =', x_max*1000, 'mm')$ $print(' Max s-s velocity =', v_max*1000, 'mm/s')$ $print(' Max s-s damping force =', f_dmax, 'N')$ $print('Dissipated energy per cycle =', pi*x_max*f_dmax, 'J/cycle')$ $Max s-s displacement = 0.02798445768194215 mm$ $Max s-s velocity = 3.516630666731356 mm/s$ $Max s-s damping force = 64.33460055342259 N$	<pre>K_dam = M*omega**2/ dam = 2*z*sqrt(M*K_ print(fmt%('β² damp print(fmt%('Suspens) print(fmt%('Suspens)</pre>	/beta2_dam _dam) ped', beta2_dam, '(rac sion Stiffness', K_dam sion Damping', dam/1E3 β² damped = 3.93 ion Stiffness = 4.84	1/1E6, 'kN/mm')) 1, 'N/(mm/s)')) 13533 (rad/s) ² 12080 kN/mm			
<pre>K = K_dam dyn_amp_fac = 1/sqrt((1-b2)**2+4*z**2*b2) x_max = f_max/K_dam * dyn_amp_fac v_max = x_max * omega f_dmax = v_max * dam print('</pre>	Dissipated Entry The dissipated energy for the damped system	nergy per cycle is 0 when the		it is equal (see the r	margin figure) to π :	$ imes x_{ ext{max}} imes f_I$
<pre>print('Dissipated energy per cycle =', pi*x_max*f_dmax, 'J/cycle') Max s-s displacement = 0.02798445768194215 mm Max s-s velocity = 3.516630666731356 mm/s Max s-s damping force = 64.33460055342259 N</pre>	<pre>K = K_dam dyn_amp_fac = 1/sqr x_max = f_max/K_dam v_max = x_max * ome f_dmax = v_max * da print(' Max s</pre>	n * dyn_amp_fac ega am s-s displacement =', >	ː_max*1000, 'mm')			
	print('Dissipated e Max s-s di Max s- Max s-s dam	splacement = 0.02798 s velocity = 3.51663 ping force = 64.3346	i*x_max*f_dmax, 'J/ 3445768194215 mm 30666731356 mm/s 50055342259 N			