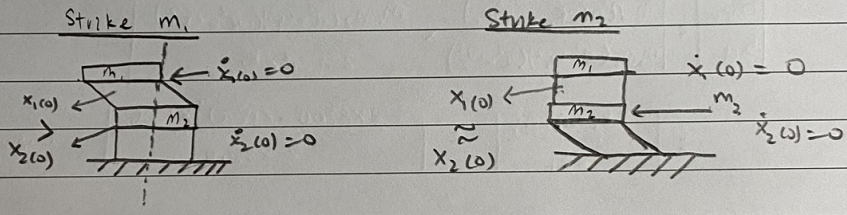
[ME47] ER CHEN KANG (U1921042D) Date No.

Results & Discussion.

1. The system does not vibrate harmonically. As seen from the graph, the curves are rather complicated and not periodic. Referring to Equations (18) and (19) represents rather complicated motions that are not periodic unless natural frequencies ω_1 and ω_2 happen to be commensurate.

2. NO. It does not ~~~~ produce similar vibration waveforms. as they have different initial conditions.



3. NO. As the waveforms of the graphs are not periodic, hence it will be different to measure the natural frequency. To measure the natural frequency, the use of oscillascope to read and eventually use Fast Fourier Transform to get the result.

4. There will be excessive vibration, which leads to stress at the support and result in collapse of the building and also high noise will be produced.
To reduce the vibration level, dampers can be added to absorb the vibrations, ~~the~~ Alternatively the motor can also be placed on the ground level instead.

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Given mass: $m_1 = 1.06\,kg$, $m_2 = 1.06\,kg$

Stiffness: $k_1 = 8800\,N/m$, $k_2 = 8520\,N/m$

$\Omega = \omega_1 = 18\pi$ $\Omega = \omega_2 = 54\pi$ Date No.

5. $$\left|\frac{A_{new}}{A_{old}}\right| = \left|\frac{2m_0\Omega^2 e k_1}{m_1 m_2(\Omega^2-\omega_1^2)(\Omega^2-\omega_2^2)} \times \frac{m_1 m_2(\Omega^2-\omega_1^2)(\Omega^2-\omega_2^2)}{m_0\Omega^2 e[2(k_1+k_2)-\Omega^2 m_2]}\right|$$

$$\omega_1 = \left|\frac{2k_1}{2(k_1+k_2)-\Omega^2 m_2}\right| = \left|\frac{2\times 8800}{2(8800+8520)-(18\pi)^2\times 1.06}\right| = 0.563 < 1$$

∴ Vibration level decrease

ω_2 $$\left|\frac{A_{new}}{A_{old}}\right| = \left|\frac{2k_1}{2(k_1+k_2)-\Omega^2 m_2}\right| = \left|\frac{2\times 8800}{2(8800+8520)-(54\pi)^2\times 1.06}\right| = 4.258 < 1$$

[∴ Vibration level increase]

ω_1 $$\left|\frac{B_{new}}{B_{old}}\right| = \left|\frac{m_0\Omega^2 e(2k_1-\Omega^2 m_1)}{m_1 m_2(\Omega^2-\omega_1^2)(\Omega^2-\omega_2^2)} \times \frac{m_1 m_2(\Omega^2-\omega_1^2)(\Omega^2-\omega_2^2)}{2m_0\Omega^2 e k_1}\right|$$

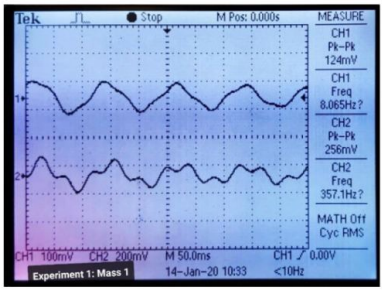
$$= \left|\frac{2k_1-\Omega^2 m_1}{2k_1}\right| = \left|\frac{2\times 8800-(18\pi)^2\times 1.06}{2\times 8800}\right| = 0.807 < 1$$ [Vibration level decrease]

ω_2 $$\left|\frac{B_{new}}{B_{old}}\right| = \left|\frac{2k_1-\Omega^2 m_1}{2k_1}\right| = \left|\frac{2\times 8800-(54\pi)^2\times 1.06}{2\times 8800}\right| = 0.733 < 1$$ [Vibration level decrease]

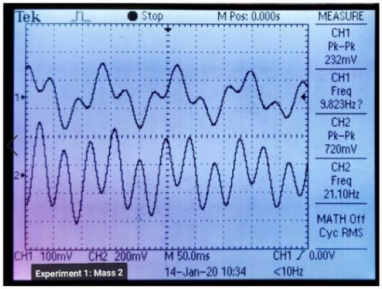
∴ Vibration level will decrease if the motor is install at mass 2, the lower base

6. I have the important of vibrations and how it can affect the structures, having different design will affect several impacts.
Overall, the online experiment is unique and easy to follow at our own pace, however it is a pity that we couldn't conduct the experiment ourselves to have the feel of it.

Strike Mass 1



Strike Mass 2



E3.2 - Experiment 2

Voltage	Mass-1		Mass-2	
	Freq (Hz)	Vib Level (mV)	Freq (Hz)	Vib Level (mV)
0.0	0	0	0	0
3.0	6.9	28	6.9	24
4.0	9.2	132	9.2	208
5.0	11.5	36	11.5	72
6.0	13.8	32	13.8	64
7.0	16.1	28	16.1	72
8.0	18.4	20	18.4	120
9.0	20.7	24	20.7	216
10.0	23	212	23	1200
11.0	25.3	68	25.3	200
12.0	27.6	44	27.6	64
13.0	29.9	48	29.9	56
14.0	32.2	48	32.2	40