ADVANCED DYNAMICS OF STRUCTURES / HOMEWORK / September 10, 2007

Consider the system shown which represents a single-story building. The mass of the columns can be neglected.

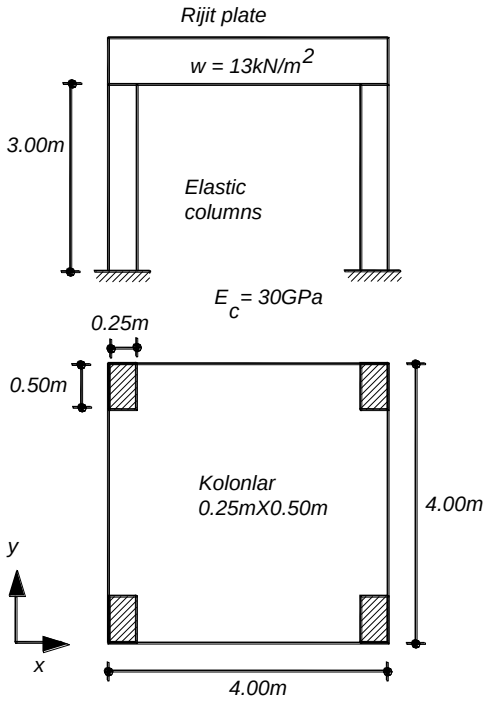
a. Obtain the lateral stiffness k and the circular frequency ω, the frequency f and the period T of the system in x and y directions separately.

b. Obtain the damping coefficient c by assuming the damping ratio $\xi = 0.05$ in x and y directions separately.

c. Draw the time variation of the lateral displacement $v(t)$ under the initial conditions $v(t=0) = 3mm$ and $\dot{v}(t=0) = 0$ in x direction by assuming $\xi = 0.0$, $\xi = 0.05$ and $\xi = 0.10$ for $0 \le t \le 4T$.

d. Draw the time variation of the lateral displacement $v(t)$ under the initial conditions $v(t=0) = 0$ and $\dot{v}(t=0) = 200mm/s$ in x direction by assuming $\xi = 0.0$, $\xi = 0.05$ and $\xi = 0.10$ for $0 \le t \le 4T$.

e. Evaluate the displacement history of the system $v(t)$ to the impulsive-load $p(t)$ in x direction. by assuming $I = 5kNs$ and $\xi = 0.05$ under the assumption of the homogeneous initial conditions $v(t=0) = 0 \quad \dot{v}(t=0) = 0$. Draw the time variation of the lateral displacement $v(t)$ $0 \le t \le 4T$ only in x direction.



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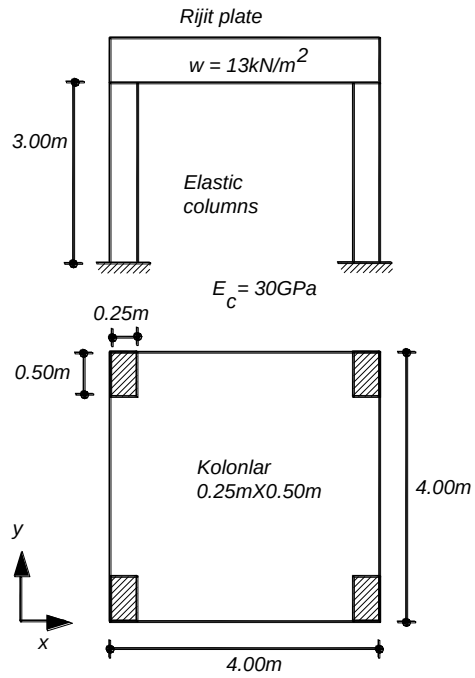

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