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Dept : Civil Engineering

Paper: Introduction to Structural Dynamic and Earthquake

Section: "C"

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Question no 1

Describe the types of the Configurations depicted in Figure 1, 2 & 3. How they can effect seismic performance of a structure and what are their possible sollutions.

Ans: **First figure** :-

⇒ Type of Configuration depicted :-

First figure is irregular shape causing less - structure response to earthquake

⇒ Its possible Solution :-

⇒ Yes we can reduce upto some extents the seismic risk in the building like rerange the nonstructural parts of the building in such a way that the centre of mass and centre of rigidity become near.

- Building envelope improvment
- Interior or Space Configuration.
- Life Safety and accessibility improvement.
- Fixing the non structural parts

Second figure

⇒ Type of Configuration depicted :-

Second figure shows Soft story phenomenon

⇒ Its possible Solution :-

⇒ In Some frames we can provide bracing that Can produce extra Stiffness in a floor where Soft Story effects. The building Could be design as limited ~~ductacty~~ ductlicity that mean we design building to cope with higher load we were also increase Stifness So we will have less deflection and then we Can avoid Soft Story effects.

Third figure :-

Type of Configuration depicted :

Third figure shows no Spacing between L shape building Causing hammer effects.

⇒ Its possible Solution :

=> If we Cannot be awarded design will typically increases the resistance of the structural design to Compensate for the increased risk.

=> And I think if we provide brasses in the Stiff beam and flexible Columns then the load distribute in the Column for no beam in different ways. we can provide steel plate at jants.

=> If the Strength | Stiffness of the Column in increased the situation can be Controlled.

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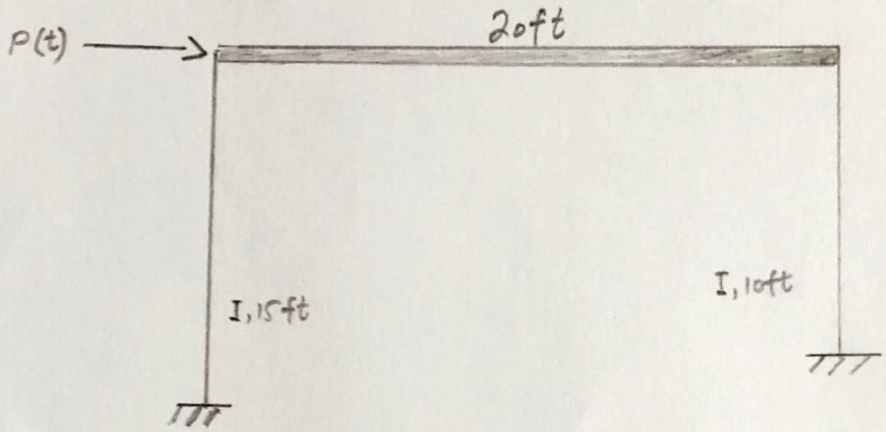
Question no 2

Problem

Develop the equation of motion of the frame shown in figure 4 under the action of a lateral dynamic force p(t). Consider a uniformly Distributed gravity load of (registration number (7772)) lb/ft acting on the beam. Neglect damping effect.



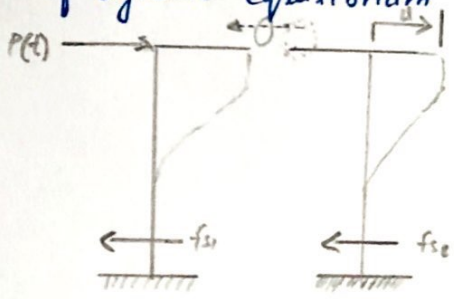
Solution

$$m = \frac{w}{g} = \frac{7772 \times 20}{32.2}$$

$$m = 4827.3 \text{ lb sec}^2/\text{ft}$$

$$\boxed{m = 4.827 \text{ slug}}$$

using D-Alembert's principle of dynamic equilibrium



$$P(t) - f_1 - f_{s1} - f_{s2} = 0$$

$$P(t) - m\ddot{u} - (f_{s1} + f_{s2}) = 0$$

$$(k_1 u + k_2 u) + m\ddot{u} = (Pt)$$

$$(ku) + m\ddot{u} = P(t)$$

$$(ku) + m\ddot{u} = P(t)$$

As, $k = 3759 \text{ k/ft}$

$$3106\ddot{u} + 3.76 * 10^6 \ddot{u} = P(t)$$