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Section C

Paper Earthquake Engineering

Q1 Describe the Types of the Configuration depects in figure 1, 2, and 3. How they Can effect Seismic performance of a Structure and What is their possible Solution

Ans **Figure 1:-**

This figure Shows discontinous Shear wall.

→ if Seismic occur and There is not a Continous load Path Through which load Transfer from roof to foundation and the result Can be Serious over Stressing at a point of discontinous. due to above Satituation Structure Can be demage and Collapse at Critical point of The Structure.

Solution:- The Solution To the problem of the discontinous Shear wall is To eliminate the Shear wall.

⇒ if the decision is made To use Shear wall then their presence must be recognized from the begining of Schesmatic design and their Size and location made the Subject of Carefull architural and Engineering Coordination early.

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Figure 2 :-

Figure 2 shows that the soft and weak stories and less stiff at ground level and above the ground level heavy and more stiffer.

Performance :-

⇒ The most prominent of the problem caused by several stress concentration is that of soft story. The term has commonly been applied to building whose ground level level story is less stiff than those above.

⇒ The building code distinguishes b/w "soft" and "weak" stories. Soft stories are less stiff or more flexible then the above weak stories have less strength.

⇒ A soft or weak story at any height creates a problem but since the comulative load are greatest towards the base of the building a discontinuity b/w first and second floor tends to result in the most serious condition.

Possible Solution :-

The Solution of this Type of problem in Structure to add the following Structural elements.

(i) Add more Column
(ii) add bracing
(iii) add external butreses.

Figure 3 :-

In figure 03 The problem Shows Re-entrant Corners.

Problem :-

There are Two problem created by These Shapes.

⇒ The first one is that They tend To produce differential motion blw different wings of the building That because of stiff elements That tends To be located in this region Result in local Stress Concentration at the re entrant Corners.

⇒ The Second Problem is Torsion. Which is caused because the center of mass and the center of rigidity in this form cannot geomatrically Consides for possible earth quake directions. The result is rotation The resulting forces are very difficult To Analyse and predict.

Solution :-

There are three Solution for This problem

⇒ Structurally Seperate The buildings.

⇒ The 2nd Solution To provide or Tie the buildings Together more Strongly With elements positioned To provide a more balanced resistence. This Solution is only applies to the Smaller buildings.

⇒ The use of Splayed rather than the right angle renentrant Corners lessens the Streis Concentration.

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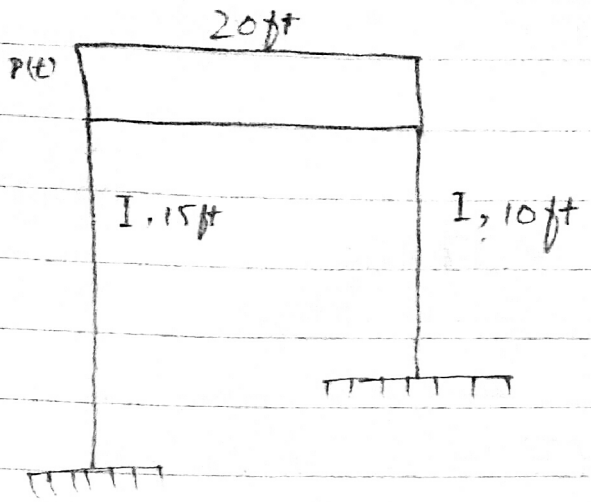
Q No 2



Given data :-

$\Rightarrow E = 29,000 \text{ ksi}$

$\Rightarrow I = 1200 \text{ in}^4$

$\Rightarrow$ uniformly Distributed Gravity load 7725 lb/ft

Required data :-

$\Rightarrow$ Develop Equation of motion = P(t) = ?

Solution :-

As; $K_{eq} = K_1 + K_2$

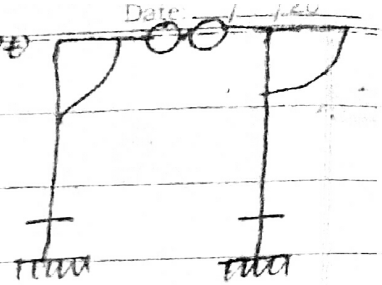
$$\Rightarrow K = 12EI\left[\frac{1}{h_1^3} + \frac{1}{h_2^3}\right]$$

$$= 12 \times 29,000 \times 1200 \times \left[\frac{1}{(15\times12)^3} + \frac{1}{(10\times12)^3}\right]$$

$$\Rightarrow K = 313.29 \text{ K/in}$$

$$= K = 3759 \text{ K/ft}$$

$K = 3.759 \times 10^6$ lb/ft



$$m = W/g = \frac{7725 \times 20}{32.2 \text{ ft/Sec}^2}$$

$$\boxed{M = 4798.13 \text{ lb} \cdot \text{Sec}^2/\text{ft}}$$

Now;

Using D-Alembert's principle of dynamics equilibrium

$$P(t) - f_I - f_{s_1} - f_{s_2} = 0$$

$$P(t) - mii - (f_{s_1} + f_{s_2}) = 0$$

$$(K_1 u + K_2 u) + mii = P(t)$$

$$(Ku) + mii = P(t)$$

putting value we get

$$\boxed{P(t) = 4798.13 + 3.759 \times 10^6}$$

where u and P(t) are in ft and lb respectively.