INTRODUCTION TO STRUCTURAL DYNAMICS & EARTHQUAKE ENGINEERING

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Q 1:-

Answer:-

Figure :- 1

Type:- This structure is a discontinue shear wall.

Incase of earthquake:-

Incase of earth quake This structure will break at centre.

Sol:-

To avoid any damage from earthquake at this structure it should be provided with additional columns, or shear walls should be eliminated or these shear walls should be continued till the end or bottom.

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Figure # 2

Type:. This is a soft story building with the lower portion is less stiffer and upper portion is more stiffer.

If earthquake happen:-

Now if an earthquake happens, as the lower portion of the structure is less stiffer so and the upper portion is more stiffer. so the lower portion will not with stand the load and will collapse.

Sol:- This structure should provided with additional coulums and additional braces. It will help the building to withstand an earthquake.

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Figure # 3

Type:- This Structure is a Re-entrained corner building.
This building is "L" shaped building.

Problem:- There are two problems in This building when earthquake occurs.

(i) There is a problem in the building wing because of the differential motion if an earthquake occurs.

(ii) The second problem which will occur is the torsion in the building, because the centre of mass and centre of rigidity in this form cannot geometrically coincide.

Sol:- There should be separation in the two portion as it is a L shaped building, or it is should be embraced or protected with

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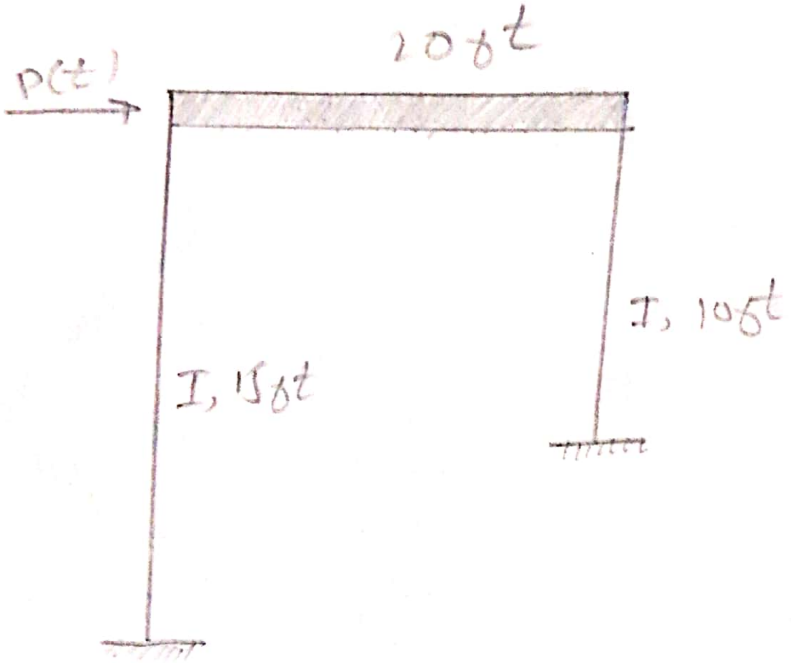
Stiff resistant element.

Q2:-



Sol:-

Given data:-

E = 29,000 ksi

I = 1200 in⁴

uniformly distribution gravity load = 7703 lb/ft

Required data:-

Develop equation of motion = P(t) = ?

Sol:-

$$m = w/g = \frac{7703 \times 20}{32.2 \text{ ft/sec}^2}$$

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$m = 4784$ lb sec^2/ft.

Now using D-Alembert's principal of dynamic equation.

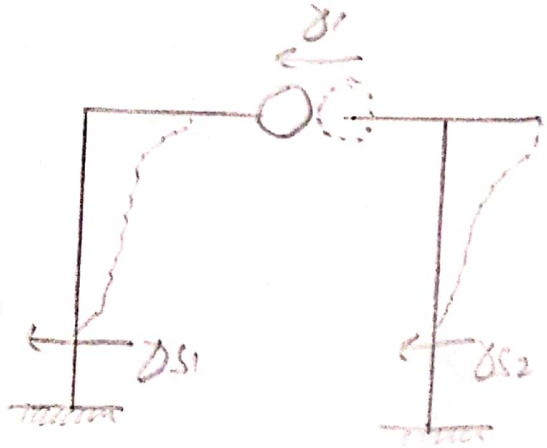
~~P(t) = 0~~

$$P(t) - f_I - f_{S_1} - f_{S_2} = 0$$

$$P(t) - m\ddot{u} - (f_{S_1} + f_{S_2}) = 0$$

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

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



As $k = 3759$ k/ft

$$\boxed{P(t) = 4784 + 3.759 \times 10^6 u}$$

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