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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) lb/ft acting on the beam. Neglect clamping effect.

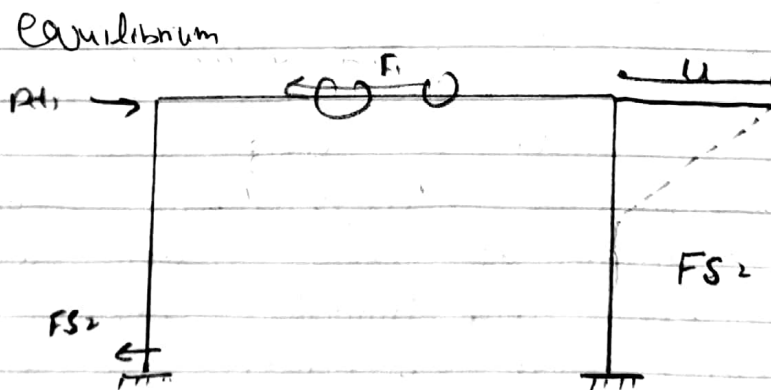
Sol As we know that

$$m = W/g$$

$$m = \frac{7549 \times 20}{32.2}$$

$$m = 4688.81 \text{ lb} \cdot \text{sec}^2 / \text{ft}$$

Using D - Alembert's principle of dynamic



$$P(t) - F_s - F_s - F_{s2} = 0$$

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

$$(K_1 u + K_2 u) + m \ddot{u} = P(t)$$

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

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

$$4688.81 + 3.76 \times 10^6 u = P(t)$$

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

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## Q1 Fig 1

Type of Configuration depicted.

\* The type of Configuration depicted in Figure-1 is discontinuous shear wall

\* A shear wall is structural component which purpose is to resist the lateral load imposed on the structure due to earthquakes.

\* When the shear wall form main lateral resistant element of a structure and there is not a continuous load path through the wall from the roof to foundation as the result can be serious. Over resting share at the point of discontinuing. The discontinuous share wall a common case of (soft) first story problem.

(\*) :- The discontinuous share wall is a foundation design contradiction. The purpose of share wall at each floor and transmit them as directly and efficiently to the foundation. To intrude this load path is undesirable.

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## Effect on the Seismic Performance of the structure.

(\*) When the earthquake comes so due to discontinuous shear wall in the structure the building will collapse in the middle and also cracks produce in the middle.

### - Possible Solution :-

1 :- The possible solution of the problem is to eliminate the shear wall.

2 :- If the final decision is to must of shear wall then the presence of shear wall must be kept in mind from the beginning of the size and location of the shear wall must be decided according to the coordination of engineer and architect.



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## Figure 2 Types of Configuration DEPICTED :-

(\*) The types of Configuration depicted in figure-2 is Soft and weak storey

(\*) A Soft story also know as weak storey is defined as a Ground level storey in the building that has substantially less resistance to stiffness than the stories above it. In essence a Soft Story has inadequate shear resistance or inadequate ductility to resist the earth quake - induced building stresses.

(\*) Soft stories are less stiff or more flexible than above all stories while the weak stories have less strength.

## Effect on the seismic Performance of the structure.

(\*) When the earth quakes come so the houses top floor put disproportionate lateral stress to the soft story due to which in case ground floor will be collapse.

**Possible solution.** Add more columns in soft story with existing columns so when the earth quakes comes then there will be more support available to resist the lateral stress as rest of which the soft story will be save from collapsing.

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2. Giving bracing between two columns which will give more support to the columns during the earth quake
3. Provides external buttresses to the soft and weak story. Buttresses will reduce the lateral story displacement, story and bending moment in column during the earth quake.

### Figure 3:

Type of Configuration depicted

- \* The type of configuration depicted in figure-3 is Re-entrant corner. The building shown in figure-3 is L-Shape building.
- \* The re-entrant corner is the common characteristics of the building forms that in plan assume the shape of an L-T, etc or a combination of these shape.

### Effect on the seismic performance of the structure.

- \* When the earth quake come so the different motion produces between the wings of the building because the stiff element located in this region as a result local stress concentration at the re-entrant corner.
- \* Also torsion product which cause because product ~~between~~ cause the center of rigidity in this form cannot geometrical code for all possible earth quake direction.

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## Possible Solution.

1. The solution of this problem is to separate the building into simple shape
2. Tie the building together more strongly with element positioned resistance
3. Use splayed rather than the right angle re-entrant corners so the stress concentration will be less