Earthquake Engineering
Summative Assessment 1

It is the structural level at which earthquake movements are anticipated to be transmitted to the structure.

Base

It is the total design lateral force or shear at the base of a structure.

Base Shear

It is a factor that accounts for the degree of hazard to human life and damage to property.

Importance Factor

These are loads produced by the use and occupancy of the building and do not include construction loads.

Live Load

These are forces that results from the weight of all building materials, occupants and their environmental effects.

Loads

It is a frame in which members and joints are capable of resisting forces primarily by flexure.

MRF

It is designed to resist lateral forces parallel to the plane of the wall.

Shear Wall

Storey is the space between levels.

True

Storey moment is the summation of design lateral forces above the storey under consideration.

False

Amplitude N-S comp. = 8000, epicentral distance = 120km, find the local magnitude.

4.1 Magnitude

It is the first step in earthquake hazard assessment.

Identifying nearby seismic sources

The simplified static lateral force procedure may be used for Occupancy Category IV only.

False

Simplified static force procedure may be used for buildings not more than 2 storeys in height including the basements.

False

When the soil is not known for the simplified static procedure, which soil type should be used in seismic zone 4?

D

When the soil is not known for the simplified static procedure, which soil type should be used in seismic zone 2?

E

In Zone 4, the Na should not be greater than 1.2 if none of the ff. irregularities are present: Vert. Irreg Type 1,4 & 5.

True

Which of the following is NOT under Occupancy Category 1?

Mental Hospitals

Occupancy Category 1 is described as:

Essential Facilities

The FEU Tech and FEU Alabang Building is Occupancy Category 1.

False

Structures with a total occupancy of 2,000 persons is under Special Occupancy Structures.

False

Miscellaneous structures include private garages, sheds, and carports.

True

Which is the seismic importance factor for Occupancy Category 3?

1.00

For static force procedure, if the soil is not known in sufficient detail, what soil type should be used?

D

It is a soil profile described as very dense soil and soft rock.

C

Soil type B has a shear wave velocity ranging from 760 to 1500 m/s.

True

Philippines has 4 seismic zones

False

Jolo, Sulu is under Seismic Zone 2.

True

Busuanga, Palawan is under seismic zone 2.

False

There are 2 seismic source types.

False

It is the seismic source type capable of producing Magnitude 7 earthquake

A

The D faults are not capable of producing large magnitude earthquakes and have low rate of seismic activity.

False

If the distance other than those shown in the table is given, the near source factor can be calculated using

Linear Interpolation

Near Source Factor Na and Nv is based in the Seismic Source Type and Distance to the known seismic source.

True

The value if Seismic Coefficient Ca is based in the Soil Profile Type and Seismic Zone Factor.

True

What is the value if Ct for a composite structure made up of reinforced concrete and steel MRFs?

0.0488

There are 3 Methods for Solving the Structural Period

False

The value of T using method B shall not exceed 35% greater than T obtained using Method A.

False

What is the value of the force at the top if V = 1000 kN and T = 3.8 sec?

250 kN

The value for the force at the top if T is equal to 0.7 sec is not equal to zero.

False

The Fx in each level of the structure is applied over the area of the building in using the mass distribution at the level.

True

For the calculation of T of a structure, basement heights were included.

False

Roof Penthouses are generally not considered in determining hn for T calculations, but heights of setbacks are included.

True

The simplified static procedure is a more conservative approach than the static force procedure.

True

The R value for the orthogonal direction cannot be greater than that for the bearing wall system.

True

When a combi, of struct, systems is used in the same direction, the value of R < least value of utilized in the system.

True

1. This even struck the island of Luzon with an estimated magnitude of 7.8 occurred on?

July 1990

2. It is a ground shaking caused by a sudden slip on a fault, volcanic activity or other sudden stress changes in the earth.

Earthquake

3. The following are under the Seismic Zone 2, except:

Palawan, Basilan, Sulu, Tawi- Tawi

4. How many seismic zones in the Philippines?

2

5. In Rossi-Forrel Scale, it is described to be felt generally by everyone with disturbance of furniture.

11. The fault line that is traversing Metro Manila is known as ____ except:

Shock of Moderate Intensity

6. What Chapter in the NSCP can you find the Earthquake Loads?

Chapter 2

7. Philippines have 4 Seismic Zones.

False

8. San Andreas fault is located in?

California

9. On average, how many earthquakes are recorded worldwide every year?

2000

10. The highest magnitude earthquake in the Philippines occur in the year?

1924

11. The fault line that is traversing Metro Manila is known as _____ except:

Philippine Fault System

12. It occurs when loosely packed sediments near the ground surface lose their strength in response to strong ground shaking

Liquefaction

13. What is the 2nd "S" in USGS?

Survey

14. What is the meaning of PHIVOLCS?

Philippine Institute of Volcanology and Seismology

15. What is Intensity V is Rossi-Forrel Scale?

Shock of Moderate Intensity

16. NSCP stands for?

National Structural Code of the Philippines

17. It is a path along the Pacific Ocean characterized by active volcanoes and frequent earthquakes.

Pacific Ring of Fire

18. It is a point on the earth's surface vertically above the point in the crust where a seismic rupture nucleates.

Epicenter

19. The highest recorded magnitude earthquake since the 1900s is?

1960 Chile Earthquake

20. How many soil profile types are listed in the NSCP?

6

21. Who is the director of PHIVOLCS?

Dr. Renato Solidum Jr.

22. The highest magnitude earthquake recorded in 2021 is a magnitude 8.2 earthquake. Name this seismic event.

2021 Chignik, Alaska Earthquake

23. In Geography, where is Mt. St. Helens located?

Washington

24. On average, how many earthquakes are recorded worldwide every year?

500,000

25. The highest recorded earthquake in the Philippines in 2021 is a 7.1 magnitude earthquake last August 11 occurred in?

Davao Oriental

Earthquake Engineering
Summative Assessment 3

1. It is the sum of the forces Ft and Fx above that storey

- DESIGN STOREY SHEAR

2. Vx shall be distributed to the various elements of the vertical lateral force-resisting system in proportion to their rigidities, considering the rigidity of the diaphragm.

- TRUE

3. Where diaphragms are not flexible, the mass at each level shall be assumed to be displaced from the calculated center of mass in each direction equal to _____ % of the building dimension at that level perpendicular to the direction of the force under consideration.

- 5%

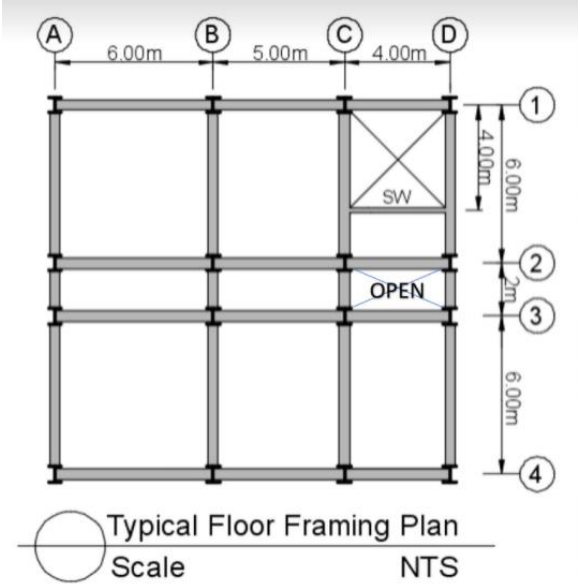
4. The effect of displacement on the storey shear distribution shall be considered.

- TRUE

5. Diaphragms shall be considered flexible for the purposes of distribution of storey shear and torsional moment when the maximum lateral deformation of the diaphragm is more than _____ times the average storey drift of the associated storey.

- 2

6.



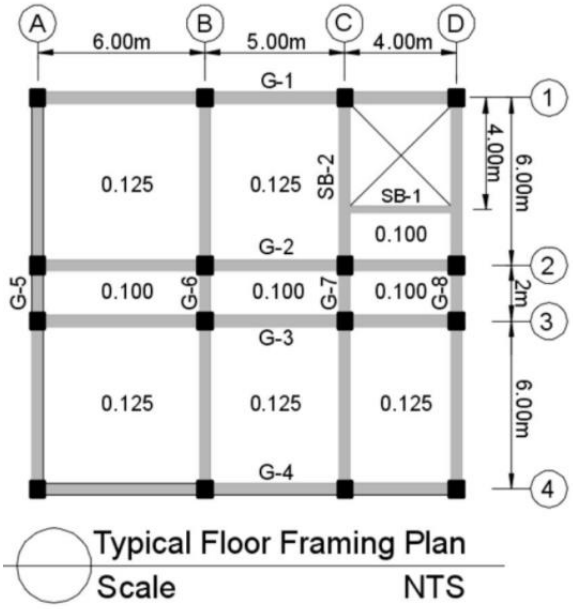
If the given plan is without a movable partition, compute WDL if the total DL is 6.92kPa.

- 1398 kN

Solution:

[(15)(14)−(4)(2)](6.92) = 1397.84 kN

7.



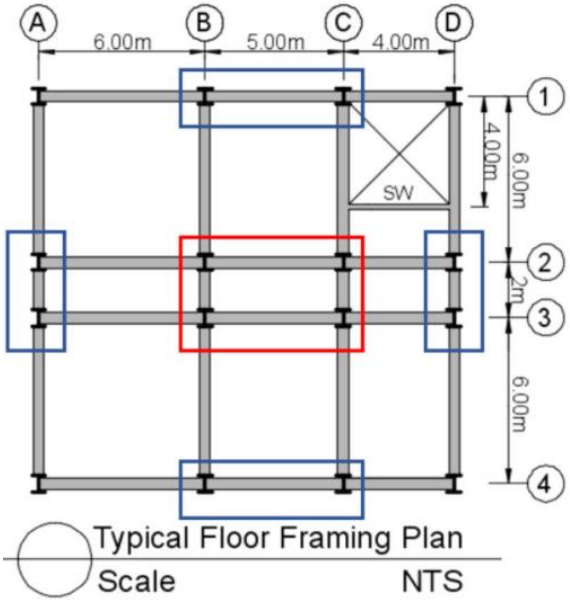
If the size of the column is 0.4x0.5m, and the height of the columns in 3.0m. Find the weight of the columns in the figure shown. (1 level only). Use density of concrete = 2400 kg/cu.m.

- 227 kN

Solution:

[(0.4)(0.5)(3)]($\frac{2400(9.81)}{1000}$)(16) = 226.0224 kN

8.



If the columns inside the red box have stiffness = 3K, column inside the blue box have stiffness = 2K, and the rest of the columns have stiffness equal to K. Considering the North to South Direction, find the R for Frame 1 (Column 1-A, 1-B, 1-C, and 1-D).

- 3/16

Solution:

Total k = 4(K)+8(2K)+4(3K) = 32K

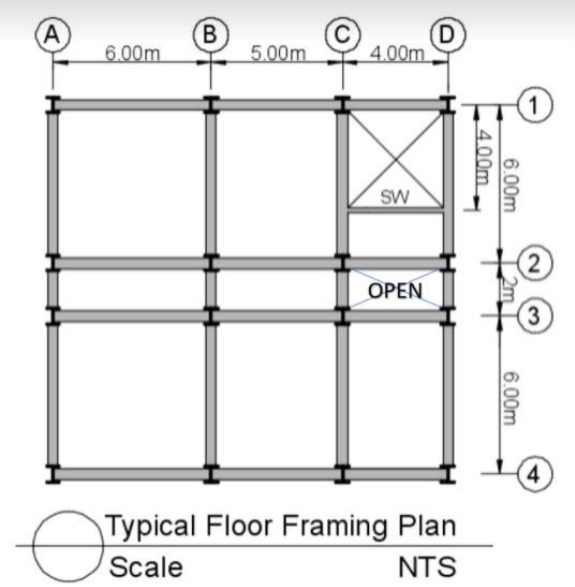
R Frame 1 = $\frac{2(K)+2(2K)}{32K} = \frac{3}{16}$

9. The summation of R in the Longitudinal and Traverse direction of the structure is equal to

- 1

10. F2 is equal to the value of R

- FALSE



11.

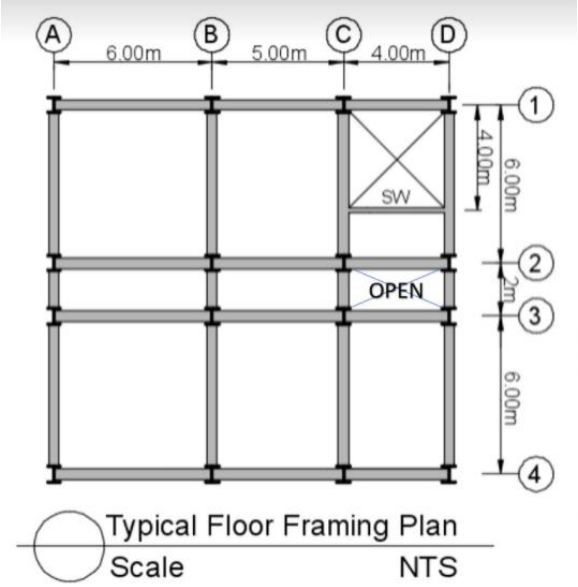
If the building reference point is Column A-1, what is the value of the center of mass in the x-direction in meters.

- 7

Solution:

202x = (11×14)(5.5)+(4×6)(11+2)(2)

x = 7.28 m



12.

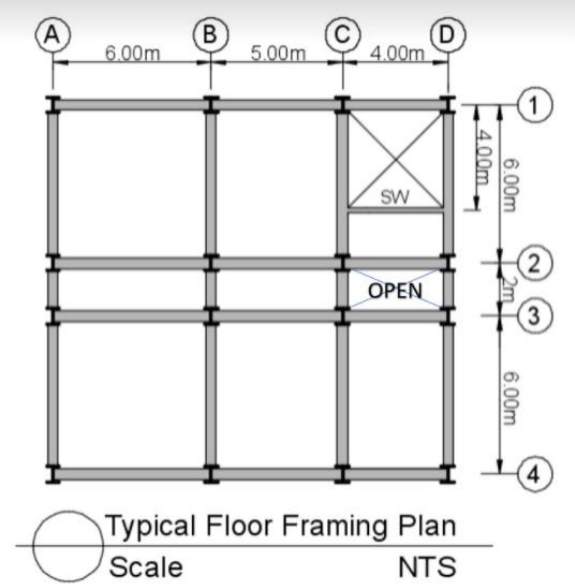
If the building reference point is Column A-1, what is the value of the center of mass in the y-direction in meters.

- 6.7

Solution:

202y = (15×6)(3)+(11×6)(6+1))+(15×6)(8+3)

y = 7 m

13. 

If the force under consideration is perpendicular to the longitudinal dimension of the structure, what is the value of accidental eccentricity?

- 0.75 m

Solution:

e_{acc} = 0.05(15) = 0.75 m

14. What is the value of the modulus of elasticity of an A36 steel?

- 200,000 MPa

15. What is the value of the modulus of rigidity of an A36 steel?

- 79.3 GPa

16. If f'c = 27 MPa, what is the modulus of elasticity of a normal weight concrete?

- 24.4 GPa

Solution:

$$\left(4700\sqrt{27}\right) \times \frac{1\ GPa}{1000\ MPa} = \ 24.4\ GPa$$

17. What is modulus of rigidity of concrete?

- 9.92 GPa

18. A circular column has the following characteristics: h=3.0m, D=0.5m, E=24.84 GPa, G=9.92 GPa, find the displacement due to flexure.

- None of these (Ans. 0.02952)

Solution:

$$\frac{1000(3)^3}{12(24.84 \times 10^6)(\frac{\pi(0.5)^4}{64})} = 0.02952439524$$

19. A circular column has the following characteristics: h=3.0m, D=0.5m, E=24.84 GPa, G=9.92 GPa, find the displacement due to shear.

- None of these (Ans. 0.00185)

Solution:

$$\frac{1.2(1000)(3)}{(9.92 \times 10^6)(\frac{\pi(0.5)^2}{4})} = 0.00184825$$

20. The eccentricity in either direction is equal to the absolute sum of the values of center of mass and center of rigidity.

- FALSE

Summative Assessment 4 - Storey Displacement

Started: Nov 29 at 11:06pm

Quiz Instructions

Choose the BEST answer.

Question 1 1 pts

The framing plan of a concrete SMRF building is shown below. If the total height of the structure is 21 meters (3 meters per level), compute the displacements for both N-S and W-E direction (in each levels). Use column A-1 as the building reference point. Assume the lateral forces to be acting at the building's least dimension. Columns are located at the intersections of the grid lines.

Column Properties:

$E = 24.84 \times 10^6$ kPa $G = 9.92 \times 10^6$ kPa

Seismic Data:

$C_v = 0.51$

$I = 1.25$

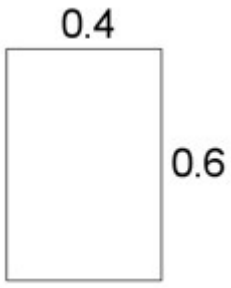
$R = 8.5$

$C_a = 0.38$

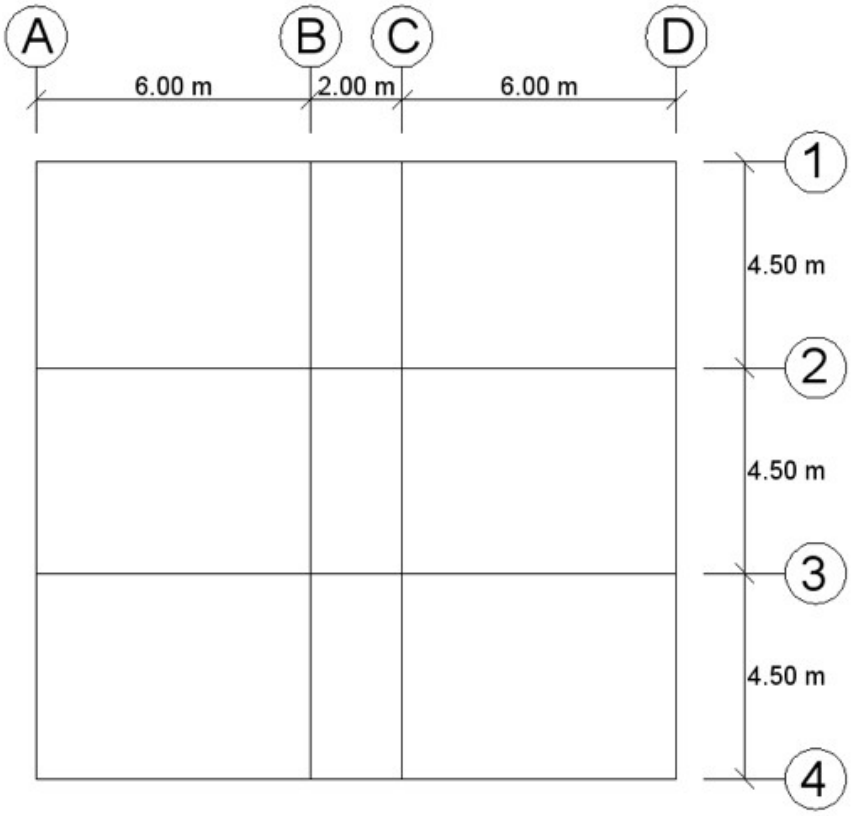
$Z = 0.40$

$N_v = 1.60$

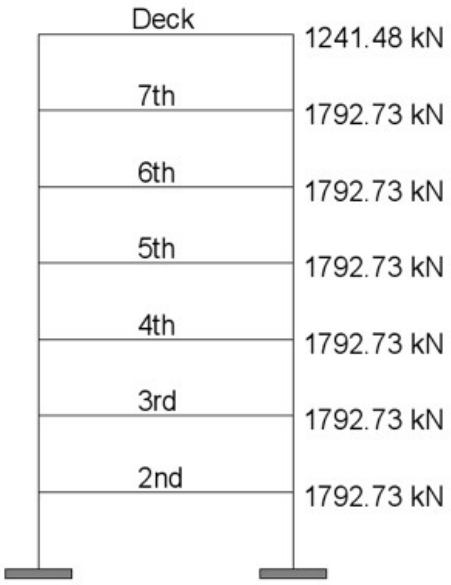
Column Size:



Framing Plan:



Weight per Level:



What is the displacement at the 3rd level considering the North to South Direction?

- (●) 2.2 mm
- ( ) 3.2 mm
- ( ) 2.7 mm
- ( ) 3.7 mm

Question 2 1 pts

The framing plan of a concrete SMRF building is shown below. If the total height of the structure is 21 meters (3 meters per level), compute the displacements for both N-S and W-E direction (in each levels). Use column A-1 as the building reference point. Assume the lateral forces to be acting at the building's least dimension. Columns are located at the intersections of the grid lines.

Column Properties:

$E = 24.84 \times 10^6$ kPa $G = 9.92 \times 10^6$ kPa

Seismic Data:

$C_v = 0.51$

$I = 1.25$

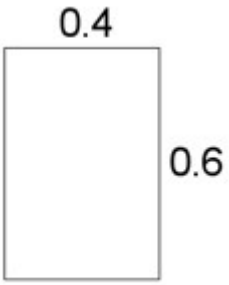
$R = 8.5$

$C_a = 0.38$

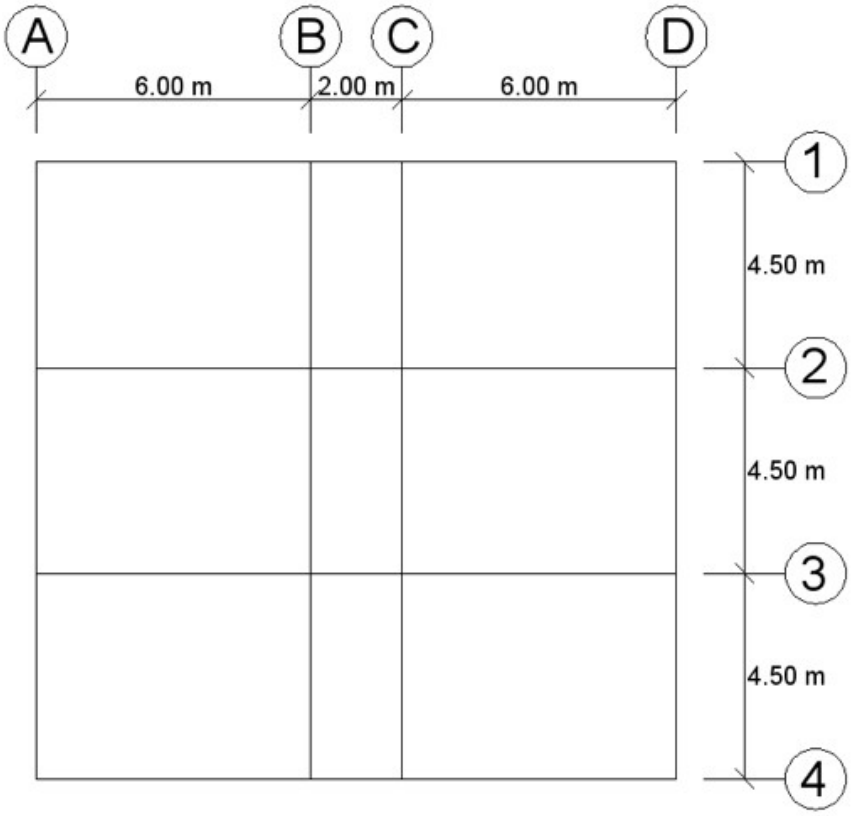
$Z = 0.40$

$N_v = 1.60$

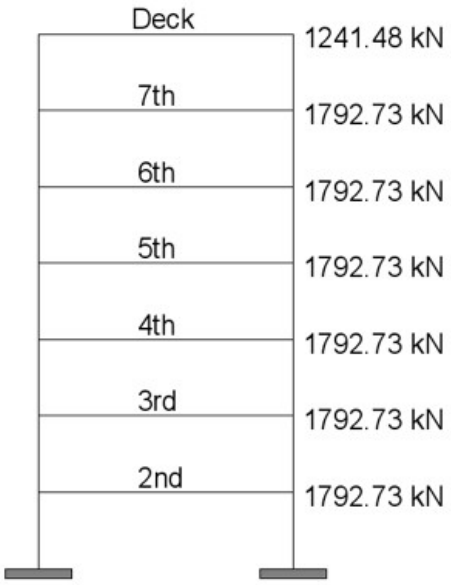
Column Size:



Framing Plan:



Weight per Level:



What is the displacement at the 4th level considering the North to South Direction?

- ○ 3.7 mm
- ○ 2.2 mm
- ◉ 3.2 mm
- ○ 2.7 mm

Question 3 1 pts

The framing plan of a concrete SMRF building is shown below. If the total height of the structure is 21 meters (3 meters per level), compute the displacements for both N-S and W-E direction (in each levels). Use column A-1 as the building reference point. Assume the lateral forces to be acting at the building's least dimension. Columns are located at the intersections of the grid lines.

Column Properties:

$E = 24.84 \times 10^6$ kPa $G = 9.92 \times 10^6$ kPa

Seismic Data:

$C_v = 0.51$

$I = 1.25$

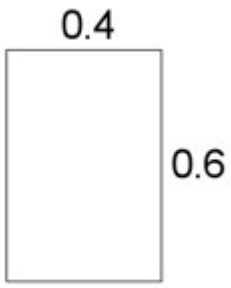
$R = 8.5$

$C_a = 0.38$

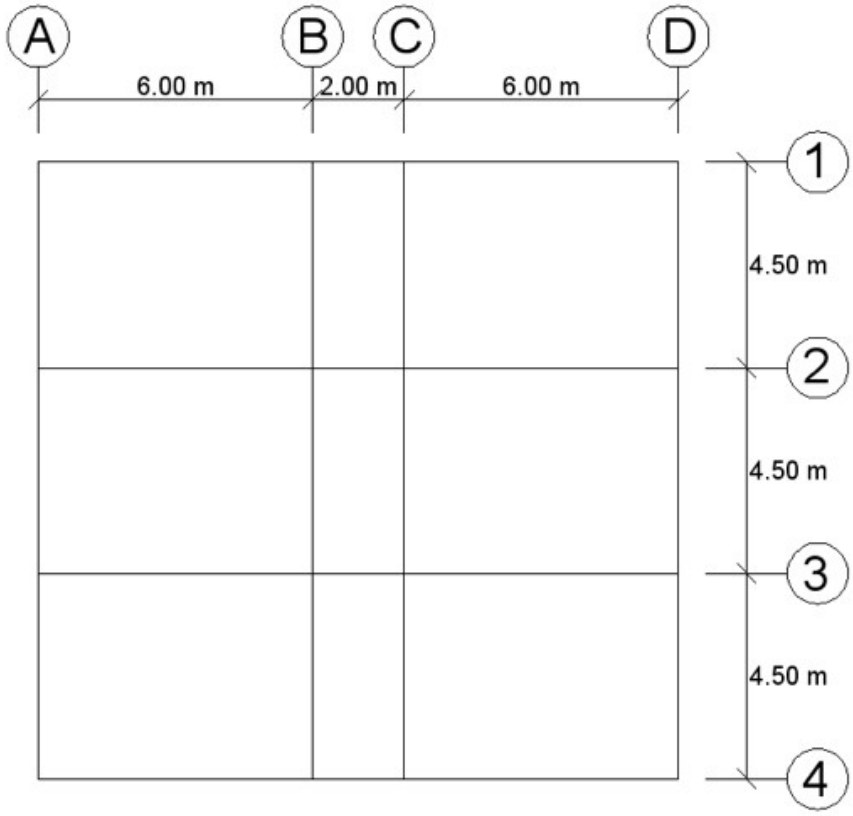
$Z = 0.40$

$N_v = 1.60$

Column Size:



Framing Plan:



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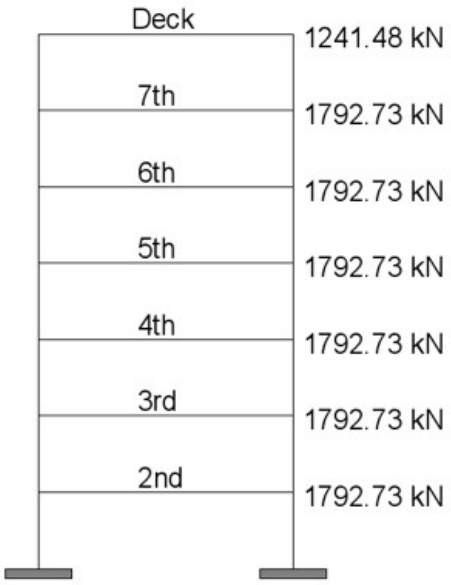


What is the factor "F" for frame B (North to South direction)?

- ○ 0.29725
- ◉ 0.25675
- ○ 0.26125
- ○ 0.27325

Question 4 — 1 pts

The framing plan of a concrete SMRF building is shown below. If the total height of the structure is 21 meters (3 meters per level), compute the displacements for both N-S and W-E direction (in each levels). Use column A-1 as the building reference point. Assume the lateral forces to be acting at the building's least dimension. Columns are located at the intersections of the grid lines.

Column Properties:

$E = 24.84 \times 10^6$ kPa $G = 9.92 \times 10^6$ kPa

Seismic Data:

$C_v = 0.51$

$I = 1.25$

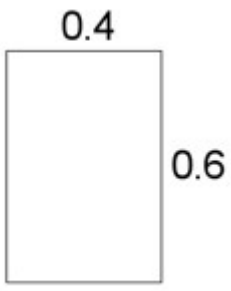
$R = 8.5$

$C_a = 0.38$

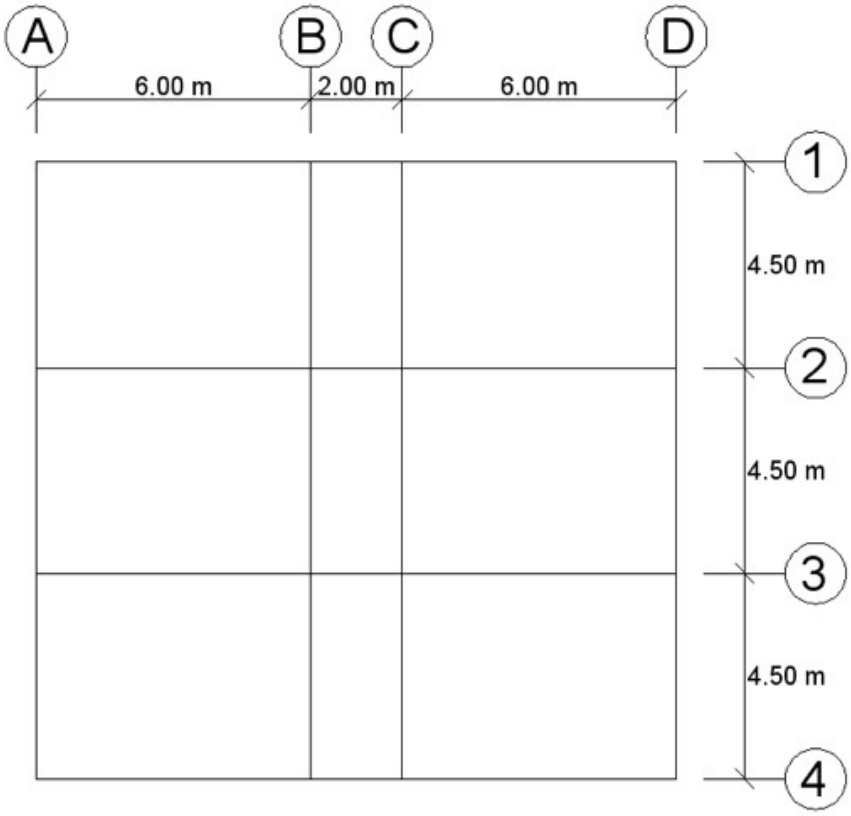
$Z = 0.40$

$N_v = 1.60$

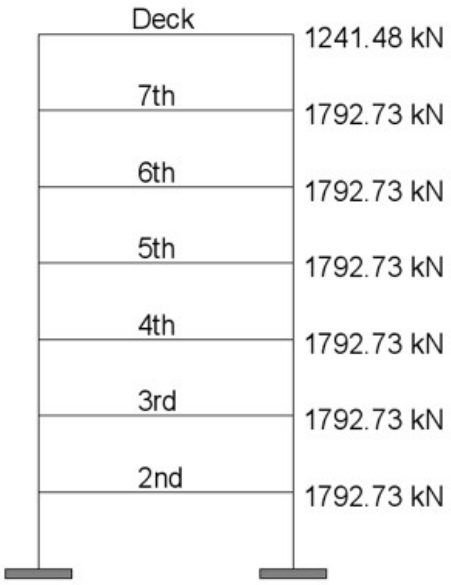
Column Size:



Framing Plan:



Weight per Level:



What is the factor "F" for frame D (North to South direction)?

- ○ 0.27325
- ○ 0.26125
- ○ 0.25675
- ◉ 0.29725

Question 5 1 pts

The framing plan of a concrete SMRF building is shown below. If the total height of the structure is 21 meters (3 meters per level), compute the displacements for both N-S and W-E direction (in each levels). Use column A-1 as the building reference point. Assume the lateral forces to be acting at the building's least dimension. Columns are located at the intersections of the grid lines.

Column Properties:

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Seismic Data:

$C_v = 0.51$

$I = 1.25$

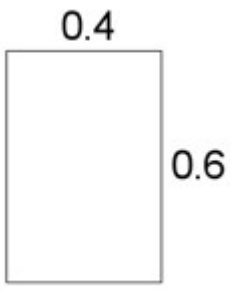
$R = 8.5$

$C_a = 0.38$

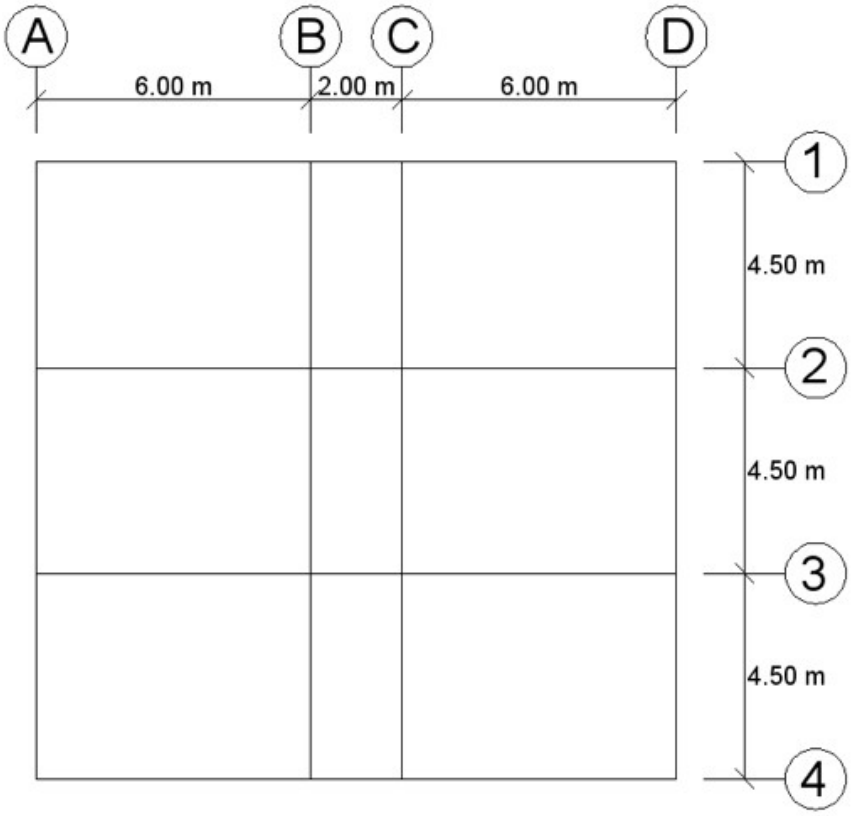
$Z = 0.40$

$N_v = 1.60$

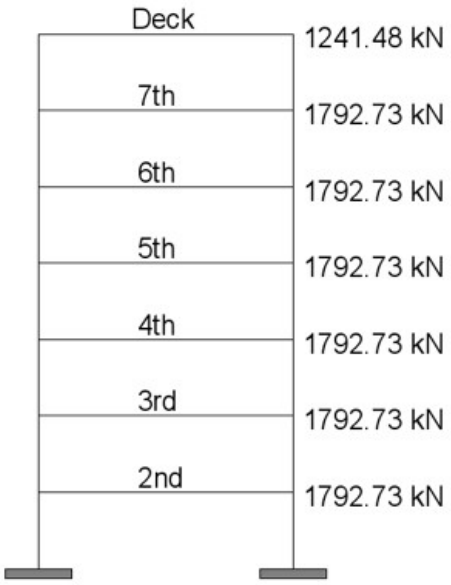
Column Size:



Framing Plan:



Weight per Level:



What is the displacement at the 2nd level considering the West to East Direction?

- ○ 2.8 mm
- ○ 1.8 mm
- ○ 3.3 mm
- ◉ 2.3 mm

Question 6 1 pts

The framing plan of a concrete SMRF building is shown below. If the total height of the structure is 21 meters (3 meters per level), compute the displacements for both N-S and W-E direction (in each levels). Use column A-1 as the building reference point. Assume the lateral forces to be acting at the building's least dimension. Columns are located at the intersections of the grid lines.

Column Properties:

$E = 24.84 \times 10^6$ kPa $G = 9.92 \times 10^6$ kPa

Seismic Data:

$C_v = 0.51$

$I = 1.25$

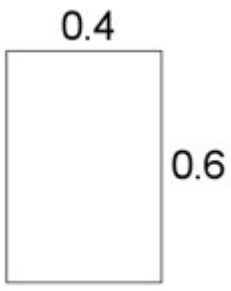
$R = 8.5$

$C_a = 0.38$

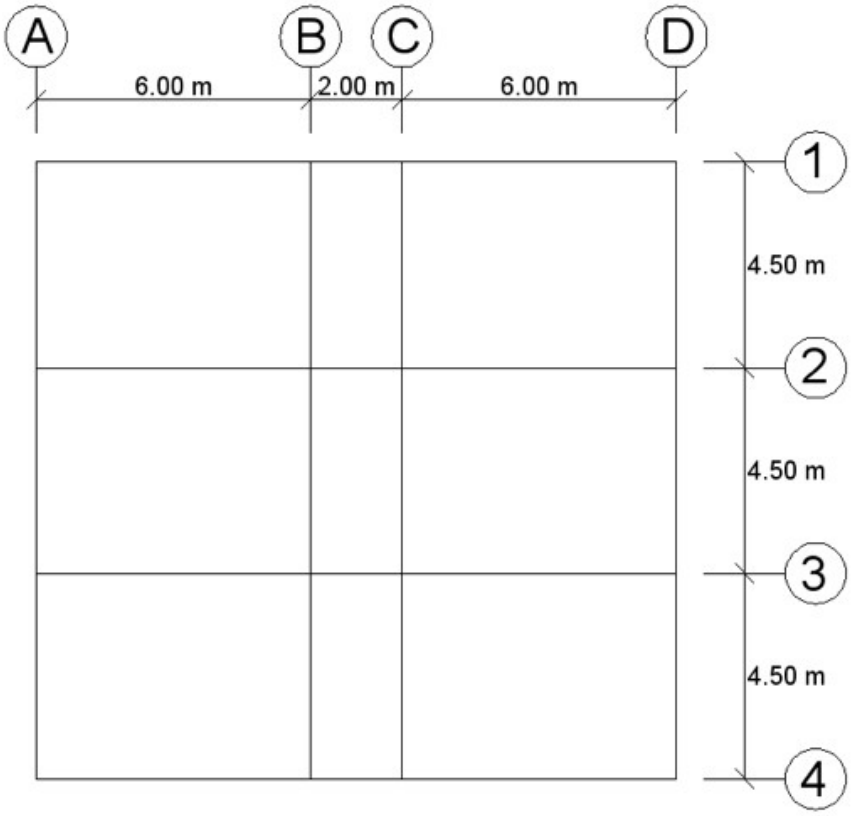
$Z = 0.40$

$N_v = 1.60$

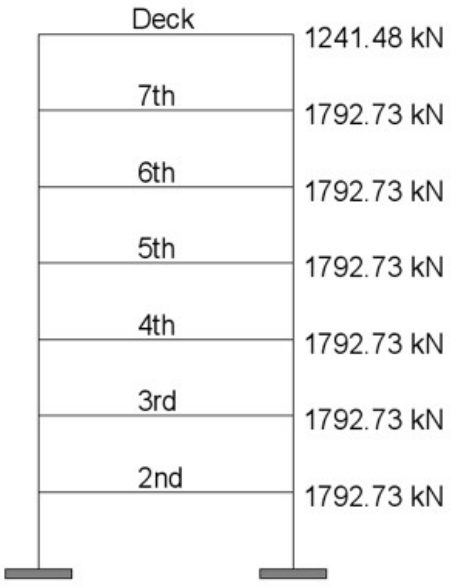
Column Size:



Framing Plan:



Weight per Level:



What is the displacement at the 6th level considering the West to East Direction?

- ○ 9.0 mm
- ◉ 9.5 mm
- ○ 8.5 mm
- ○ 8.0 mm

Question 7 1 pts

The framing plan of a concrete SMRF building is shown below. If the total height of the structure is 21 meters (3 meters per level), compute the displacements for both N-S and W-E direction (in each levels). Use column A-1 as the building reference point. Assume the lateral forces to be acting at the building's least dimension. Columns are located at the intersections of the grid lines.

Column Properties:

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Seismic Data:

$C_v = 0.51$

$I = 1.25$

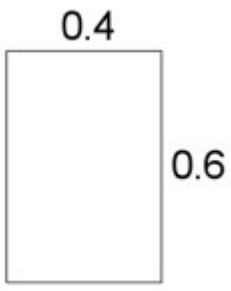
$R = 8.5$

$C_a = 0.38$

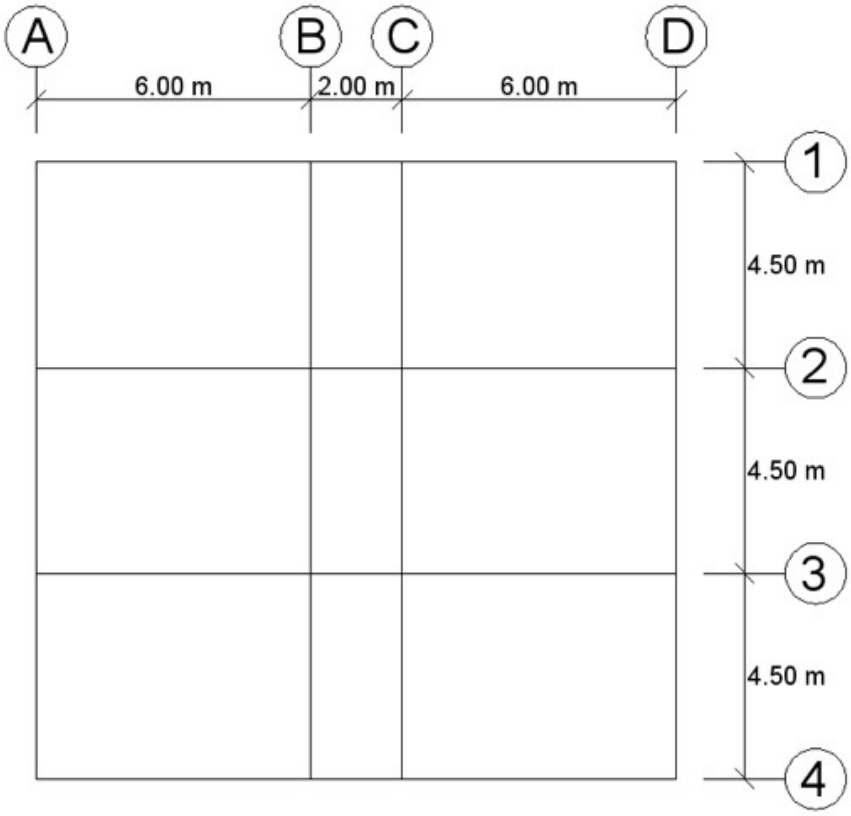
$Z = 0.40$

$N_v = 1.60$

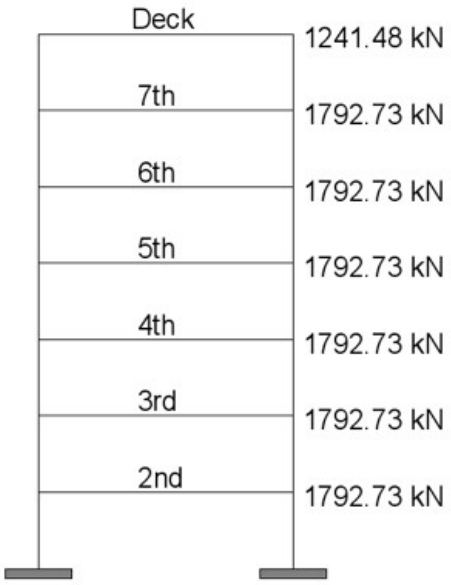
Column Size:



Framing Plan:



Weight per Level:



What is the displacement at the Deck level considering the West to East Direction?

- (●) 11.6 mm
- ( ) 11.0 mm
- ( ) 12.2 mm
- ( ) 12.8 mm

Question 8 1 pts

The framing plan of a concrete SMRF building is shown below. If the total height of the structure is 21 meters (3 meters per level), compute the displacements for both N-S and W-E direction (in each levels). Use column A-1 as the building reference point. Assume the lateral forces to be acting at the building's least dimension. Columns are located at the intersections of the grid lines.

Column Properties:

$E = 24.84 \times 10^6$ kPa $G = 9.92 \times 10^6$ kPa

Seismic Data:

$C_v = 0.51$

$I = 1.25$

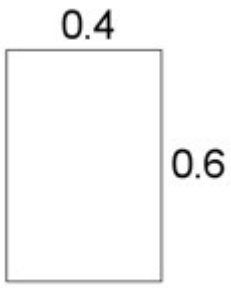
$R = 8.5$

$C_a = 0.38$

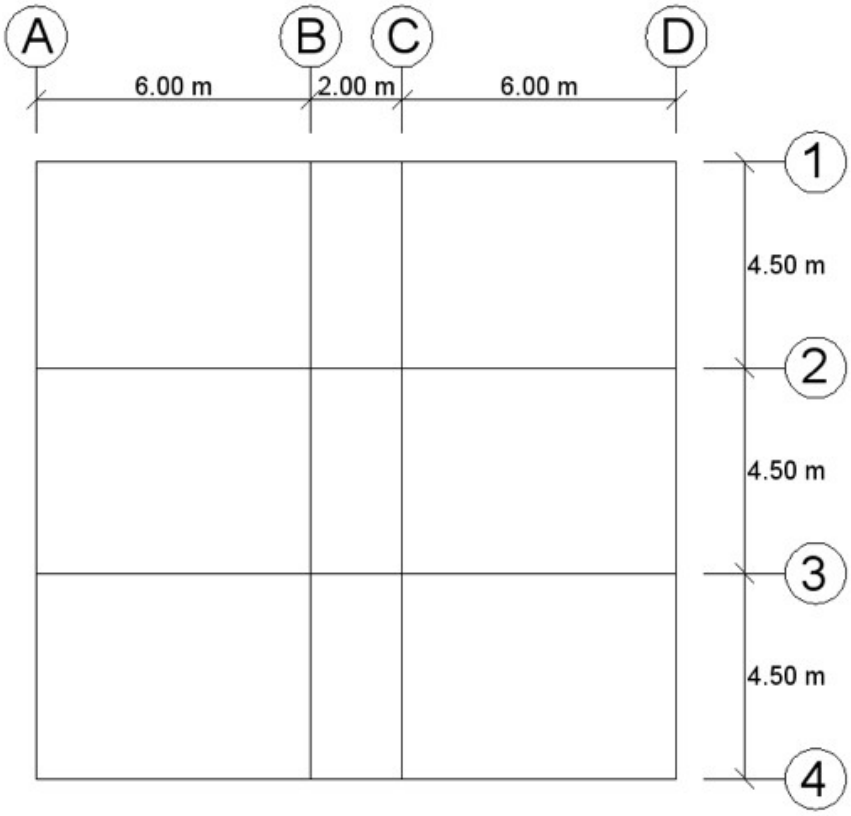
$Z = 0.40$

$N_v = 1.60$

Column Size:



Framing Plan:



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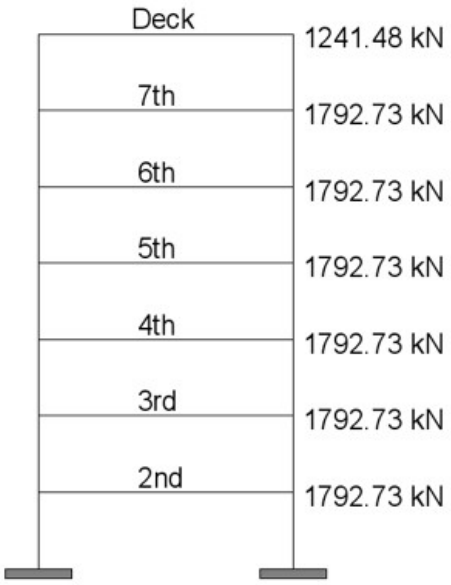


What is the displacement at the 5th level considering the North to South Direction?

- (●) 4.0 mm
- ( ) 3.5 mm
- ( ) 5.0 mm
- ( ) 4.5 mm

Question 9 1 pts

The framing plan of a concrete SMRF building is shown below. If the total height of the structure is 21 meters (3 meters per level), compute the displacements for both N-S and W-E direction (in each levels). Use column A-1 as the building reference point. Assume the lateral forces to be acting at the building's least dimension. Columns are located at the intersections of the grid lines.

Column Properties:

$E = 24.84 \times 10^6$ kPa $G = 9.92 \times 10^6$ kPa

Seismic Data:

$C_v = 0.51$

$I = 1.25$

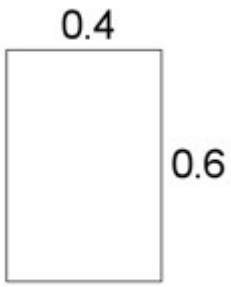
$R = 8.5$

$C_a = 0.38$

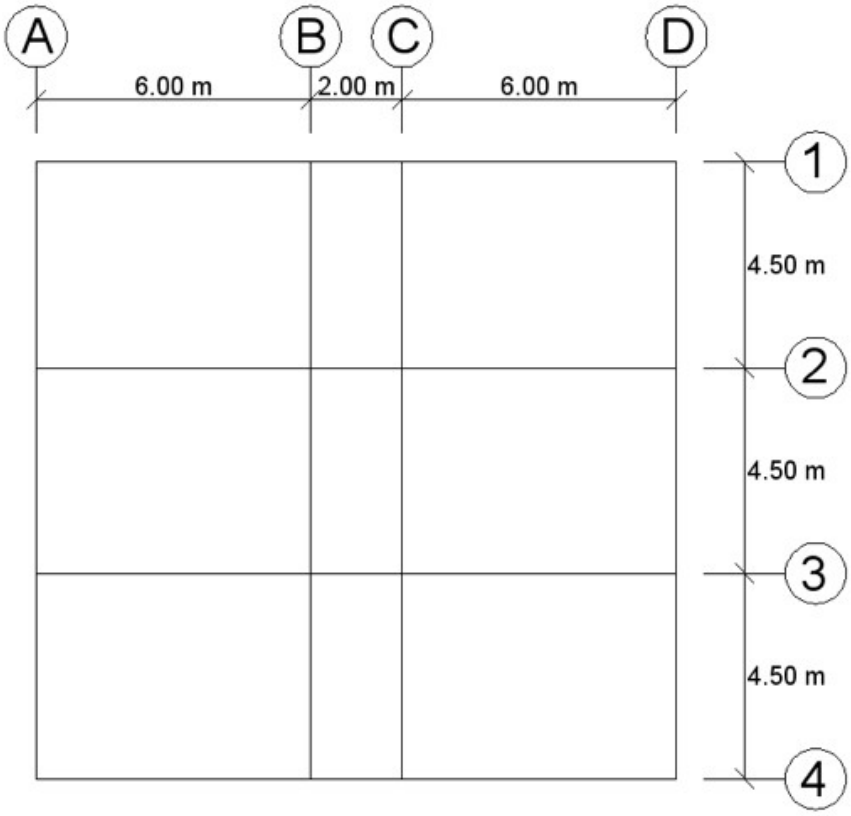
$Z = 0.40$

$N_v = 1.60$

Column Size:



Framing Plan:



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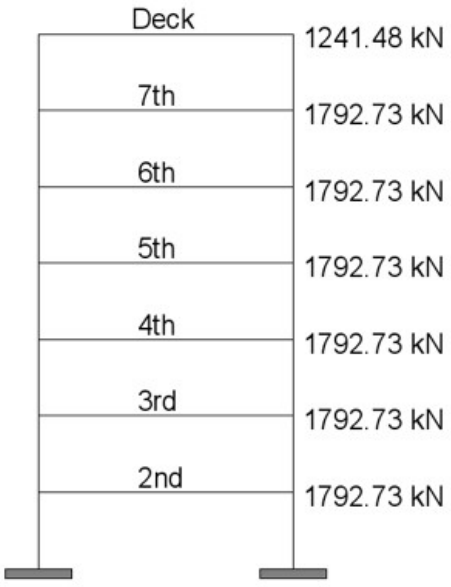


What is the displacement at the 4th level considering the West to East Direction?

- ○ 6.2 mm
- ◉ 6.7 mm
- ○ 7.2 mm
- ○ 7.7 mm

Question 10 1 pts

The framing plan of a concrete SMRF building is shown below. If the total height of the structure is 21 meters (3 meters per level), compute the displacements for both N-S and W-E direction (in each levels). Use column A-1 as the building reference point. Assume the lateral forces to be acting at the building's least dimension. Columns are located at the intersections of the grid lines.

Column Properties:

$E = 24.84 \times 10^6$ kPa $G = 9.92 \times 10^6$ kPa

Seismic Data:

$C_v = 0.51$

$I = 1.25$

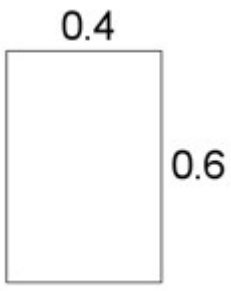
$R = 8.5$

$C_a = 0.38$

$Z = 0.40$

$N_v = 1.60$

Column Size:



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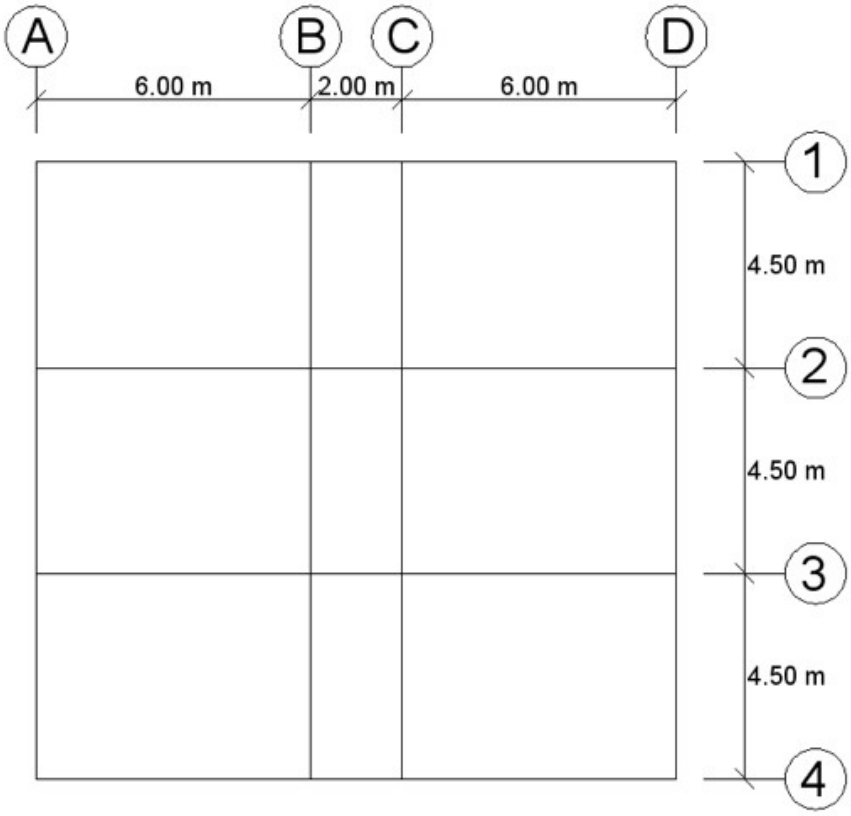

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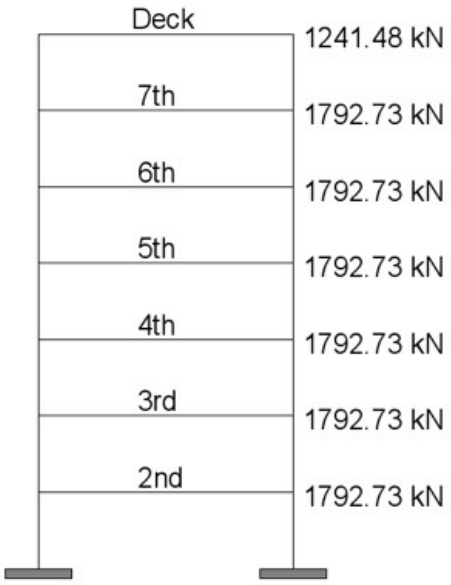


What is the displacement at the 7th level considering the North to South Direction?

- ○ 6.2 mm
- ○ 5.7 mm
- ○ 4.7 mm
- ◉ 5.2 mm

Question 11 1 pts

The framing plan of a concrete SMRF building is shown below. If the total height of the structure is 21 meters (3 meters per level), compute the displacements for both N-S and W-E direction (in each levels). Use column A-1 as the building reference point. Assume the lateral forces to be acting at the building's least dimension. Columns are located at the intersections of the grid lines.

Column Properties:

$E = 24.84 \times 10^6$ kPa $G = 9.92 \times 10^6$ kPa

Seismic Data:

$C_v = 0.51$

$I = 1.25$

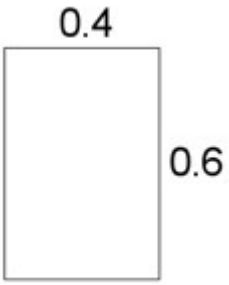
$R = 8.5$

$C_a = 0.38$

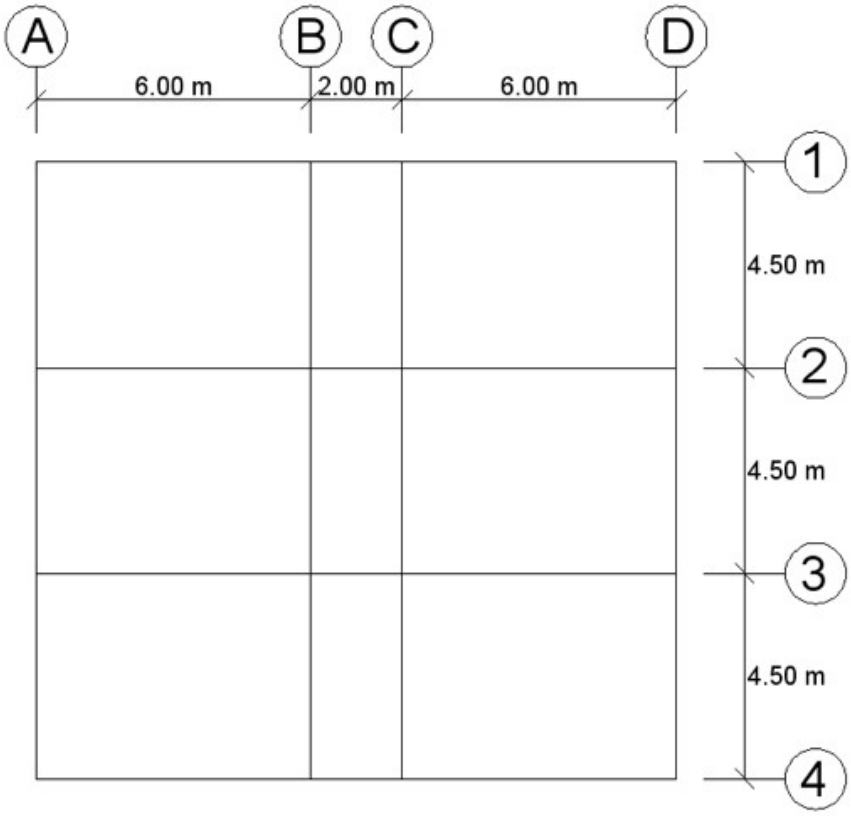
$Z = 0.40$

$N_v = 1.60$

Column Size:



Framing Plan:



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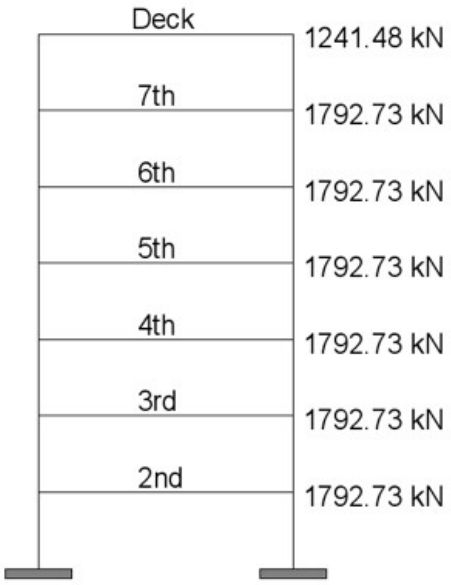


What is the displacement at the 3rd level considering the West to East Direction?

- ○ 5.8 mm
- ○ 5.2 mm
- ◉ 4.6 mm
- ○ 4.0 mm

Question 12

1 pts

The framing plan of a concrete SMRF building is shown below. If the total height of the structure is 21 meters (3 meters per level), compute the displacements for both N-S and W-E direction (in each levels). Use column A-1 as the building reference point. Assume the lateral forces to be acting at the building's least dimension. Columns are located at the intersections of the grid lines.

Column Properties:

$E = 24.84 \times 10^6$ kPa $G = 9.92 \times 10^6$ kPa

Seismic Data:

$C_v = 0.51$

$I = 1.25$

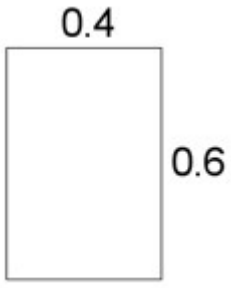
$R = 8.5$

$C_a = 0.38$

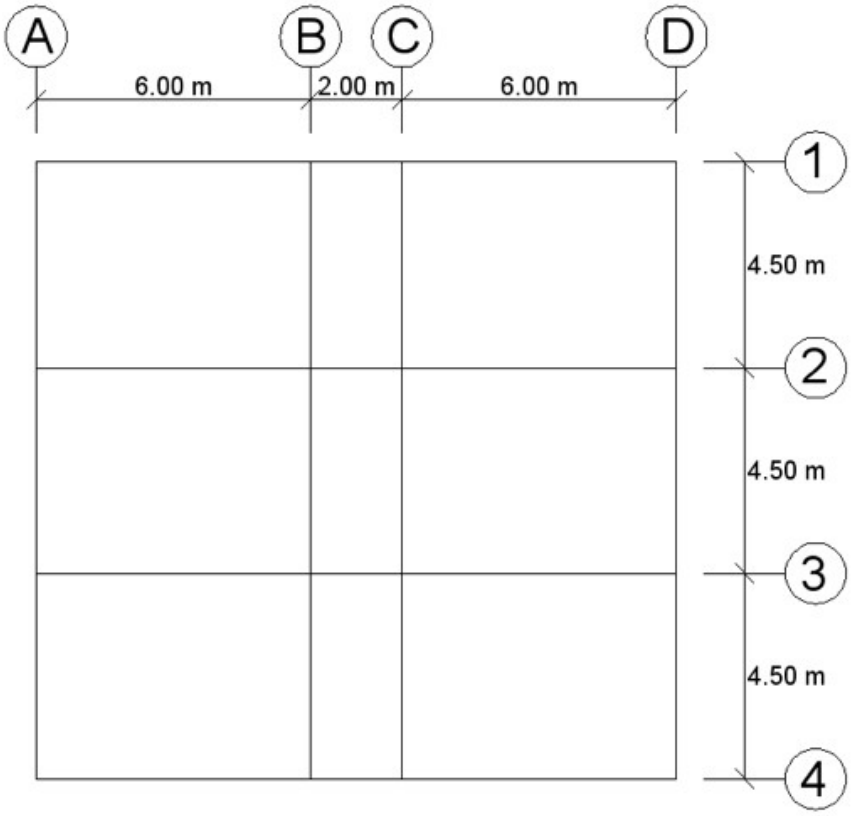
$Z = 0.40$

$N_v = 1.60$

Column Size:



Framing Plan:



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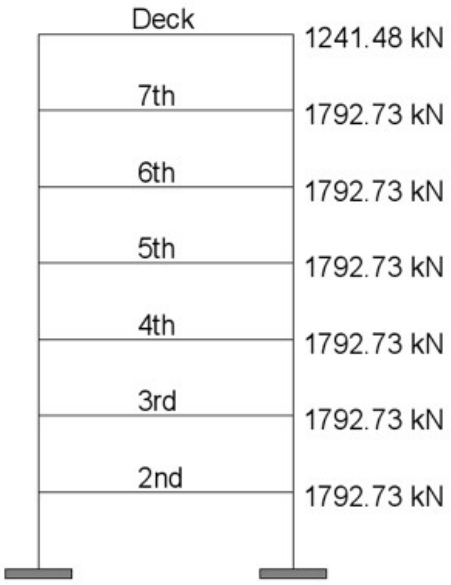


What is the displacement at the 7th level considering the West to East Direction?

- (●) 11.0 mm
- ( ) 11.5 mm
- ( ) 10.5 mm
- ( ) 12.0 mm

Question 13

1 pts

The framing plan of a concrete SMRF building is shown below. If the total height of the structure is 21 meters (3 meters per level), compute the displacements for both N-S and W-E direction (in each levels). Use column A-1 as the building reference point. Assume the lateral forces to be acting at the building's least dimension. Columns are located at the intersections of the grid lines.

Column Properties:

$E = 24.84 \times 10^6$ kPa $G = 9.92 \times 10^6$ kPa

Seismic Data:

$C_v = 0.51$

$I = 1.25$

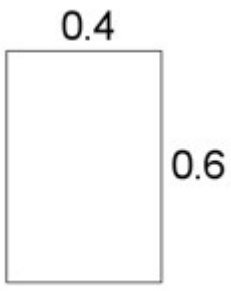
$R = 8.5$

$C_a = 0.38$

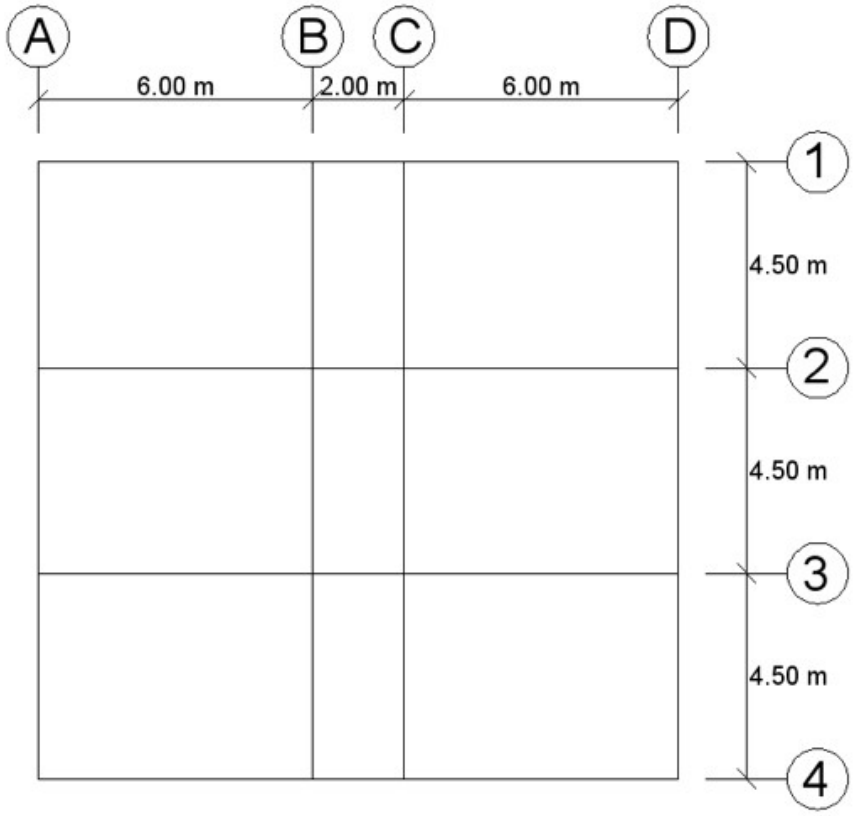
$Z = 0.40$

$N_v = 1.60$

Column Size:



Framing Plan:



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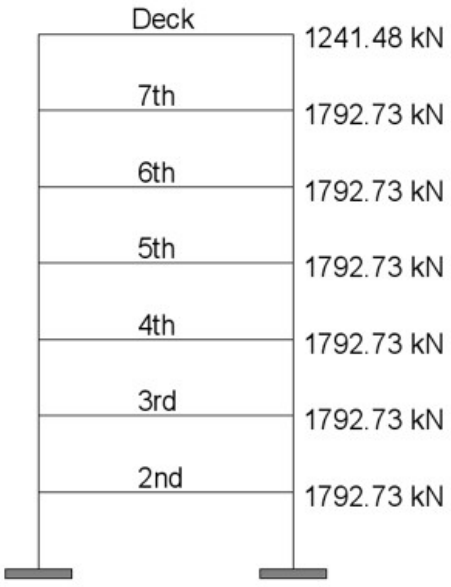


What is the factor "F" for frame 2 (West to East direction)?

- (●) 0.26500
- ( ) 0.28500
- ( ) 0.27500
- ( ) 0.29500

Question 14

1 pts

The framing plan of a concrete SMRF building is shown below. If the total height of the structure is 21 meters (3 meters per level), compute the displacements for both N-S and W-E direction (in each levels). Use column A-1 as the building reference point. Assume the lateral forces to be acting at the building's least dimension. Columns are located at the intersections of the grid lines.

Column Properties:

$E = 24.84 \times 10^6$ kPa $G = 9.92 \times 10^6$ kPa

Seismic Data:

$C_v = 0.51$

$I = 1.25$

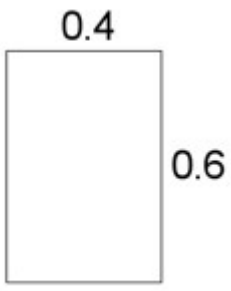
$R = 8.5$

$C_a = 0.38$

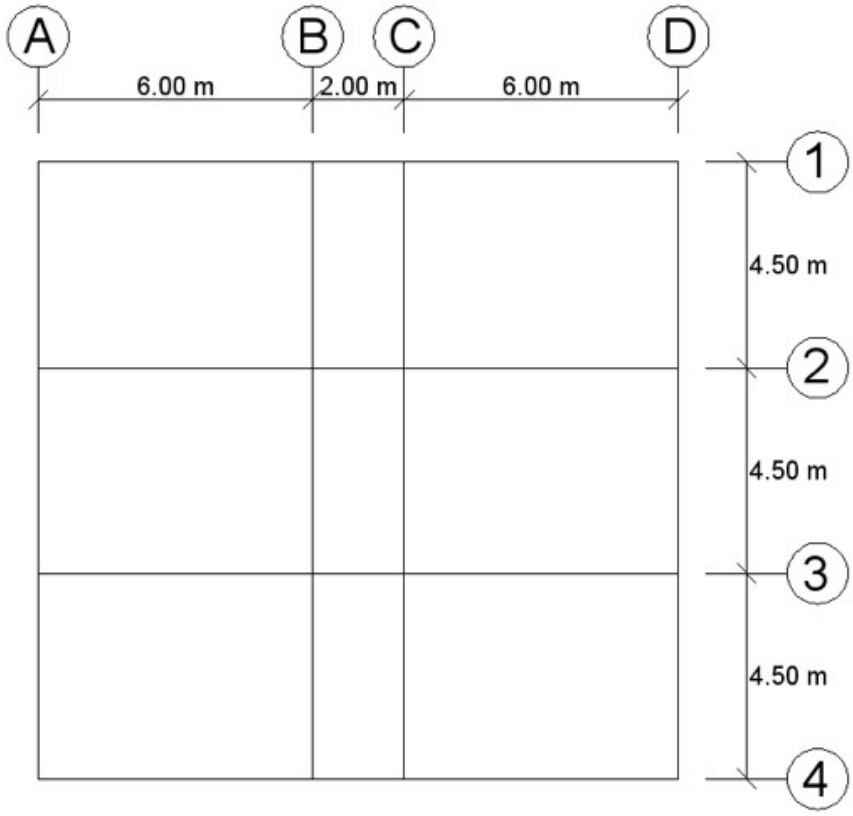
$Z = 0.40$

$N_v = 1.60$

Column Size:



Framing Plan:



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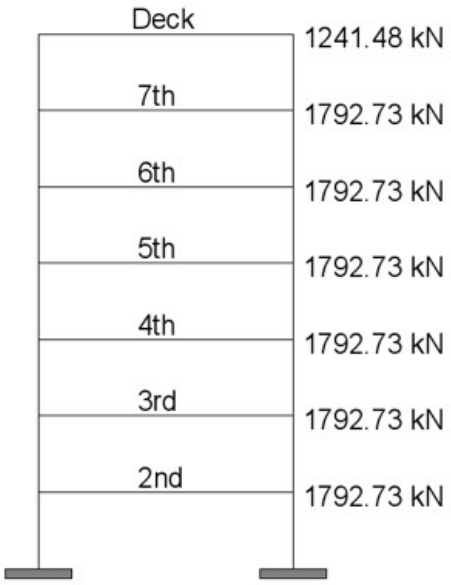


What is the factor "F" for frame 1 (West to East direction)?

- ○ 0.26500
- ○ 0.27500
- ◉ 0.29500
- ○ 0.28500

Question 15

1 pts

The framing plan of a concrete SMRF building is shown below. If the total height of the structure is 21 meters (3 meters per level), compute the displacements for both N-S and W-E direction (in each levels). Use column A-1 as the building reference point. Assume the lateral forces to be acting at the building's least dimension. Columns are located at the intersections of the grid lines.

Column Properties:

$E = 24.84 \times 10^6$ kPa $G = 9.92 \times 10^6$ kPa

Seismic Data:

$C_v = 0.51$

$I = 1.25$

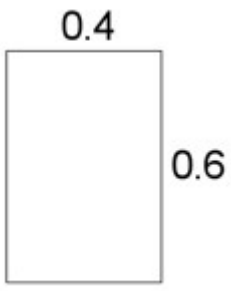
$R = 8.5$

$C_a = 0.38$

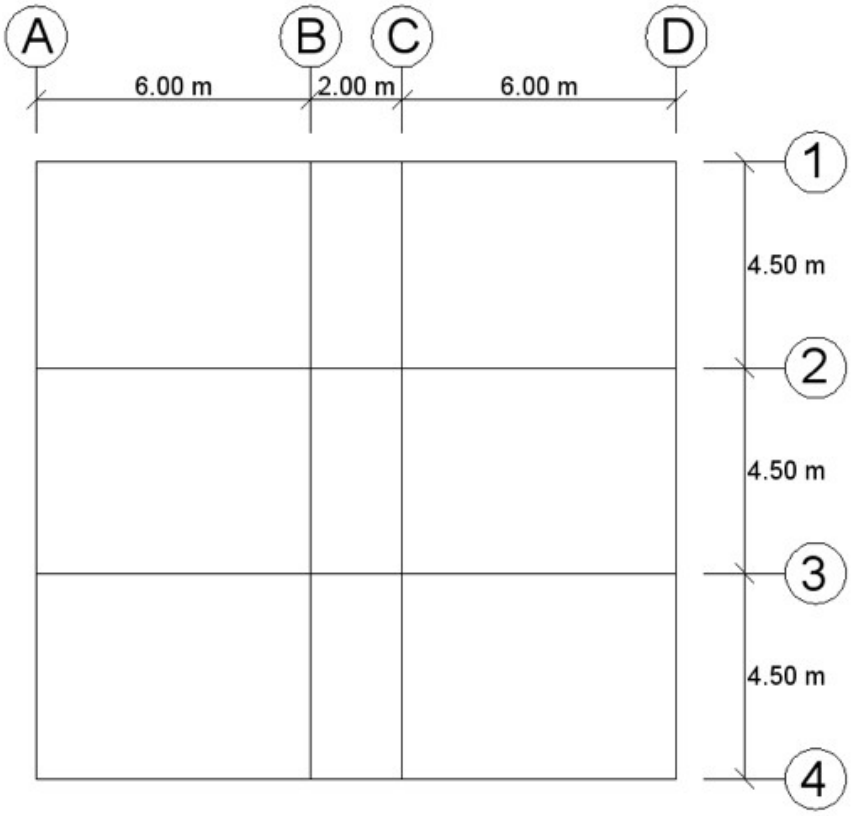
$Z = 0.40$

$N_v = 1.60$

Column Size:



Framing Plan:



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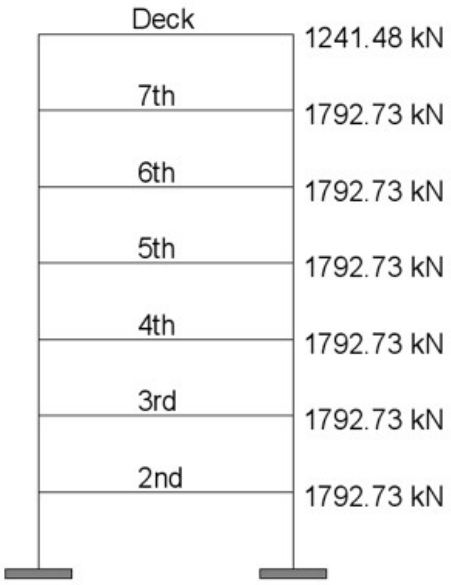


What is the displacement at the 5th level considering the West to East Direction?

- (●) 8.5 mm
- ( ) 9.0 mm
- ( ) 9.5 mm
- ( ) 8.0 mm

Question 16

1 pts

The framing plan of a concrete SMRF building is shown below. If the total height of the structure is 21 meters (3 meters per level), compute the displacements for both N-S and W-E direction (in each levels). Use column A-1 as the building reference point. Assume the lateral forces to be acting at the building's least dimension. Columns are located at the intersections of the grid lines.

Column Properties:

$E = 24.84 \times 10^6$ kPa $G = 9.92 \times 10^6$ kPa

Seismic Data:

$C_v = 0.51$

$I = 1.25$

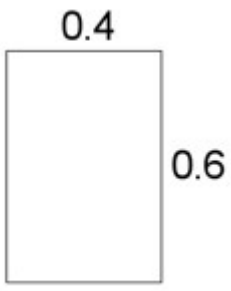
$R = 8.5$

$C_a = 0.38$

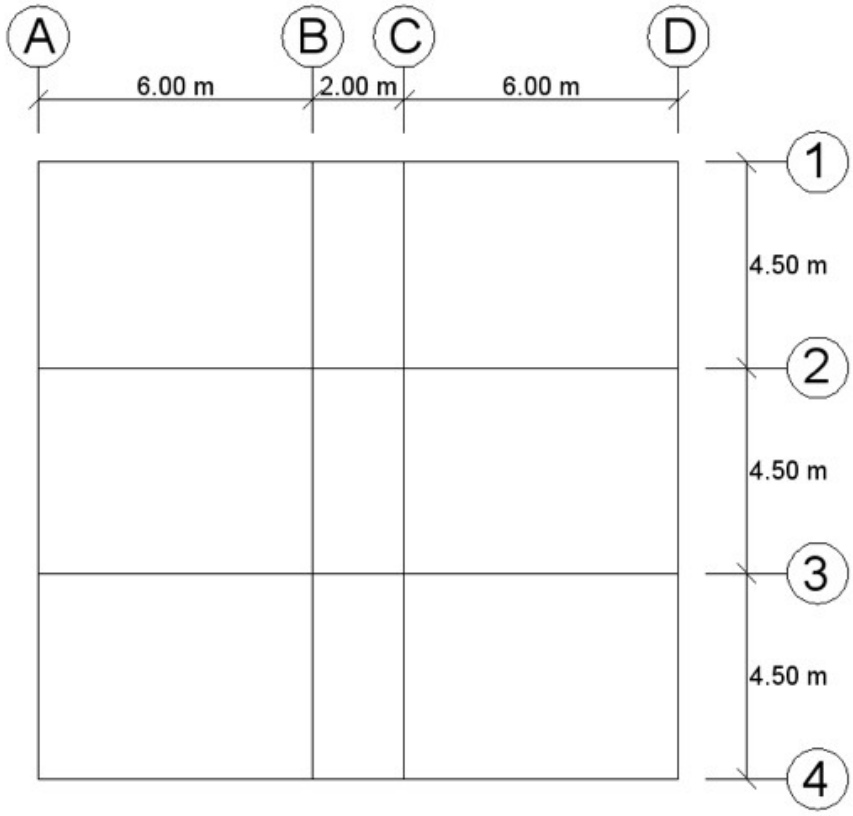
$Z = 0.40$

$N_v = 1.60$

Column Size:



Framing Plan:



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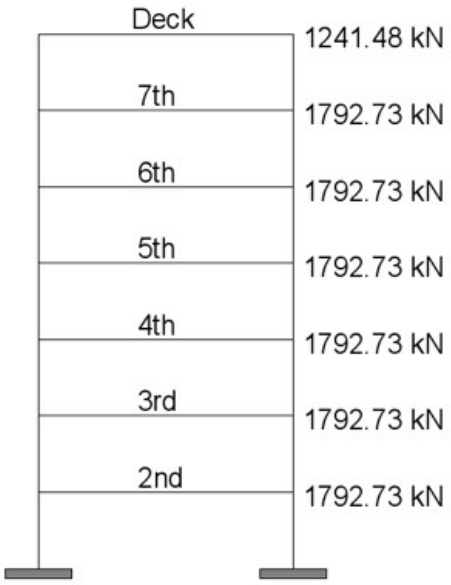


What is the factor "F" for frame 4 (West to East direction)?

- (●) 0.29500
- ( ) 0.27500
- ( ) 0.28500
- ( ) 0.26500

Question 17

1 pts

The framing plan of a concrete SMRF building is shown below. If the total height of the structure is 21 meters (3 meters per level), compute the displacements for both N-S and W-E direction (in each levels). Use column A-1 as the building reference point. Assume the lateral forces to be acting at the building's least dimension. Columns are located at the intersections of the grid lines.

Column Properties:

$E = 24.84 \times 10^6$ kPa $G = 9.92 \times 10^6$ kPa

Seismic Data:

$C_v = 0.51$

$I = 1.25$

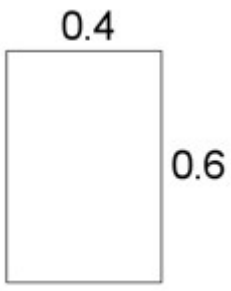
$R = 8.5$

$C_a = 0.38$

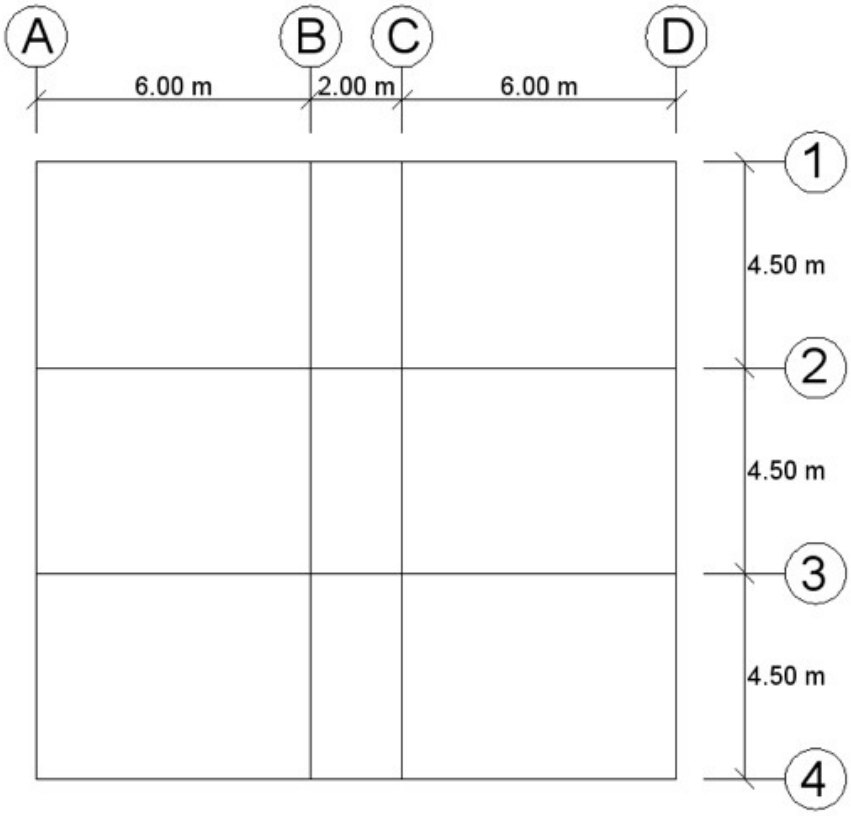
$Z = 0.40$

$N_v = 1.60$

Column Size:



Framing Plan:



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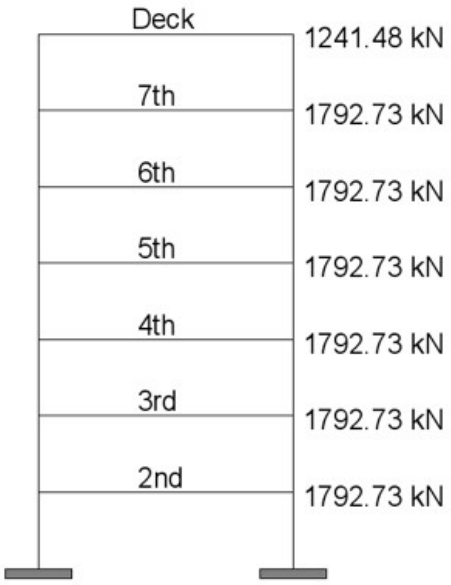


What is the displacement at the 6th level considering the North to South Direction?

- (◉) 4.7 mm
- ( ) 3.7 mm
- ( ) 4.2 mm
- ( ) 5.2 mm

Question 18 1 pts

The framing plan of a concrete SMRF building is shown below. If the total height of the structure is 21 meters (3 meters per level), compute the displacements for both N-S and W-E direction (in each levels). Use column A-1 as the building reference point. Assume the lateral forces to be acting at the building's least dimension. Columns are located at the intersections of the grid lines.

Column Properties:

$E = 24.84 \times 10^6$ kPa $G = 9.92 \times 10^6$ kPa

Seismic Data:

$C_v = 0.51$

$I = 1.25$

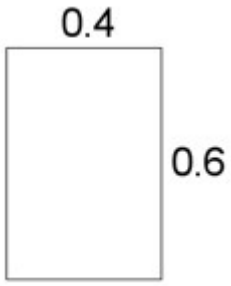
$R = 8.5$

$C_a = 0.38$

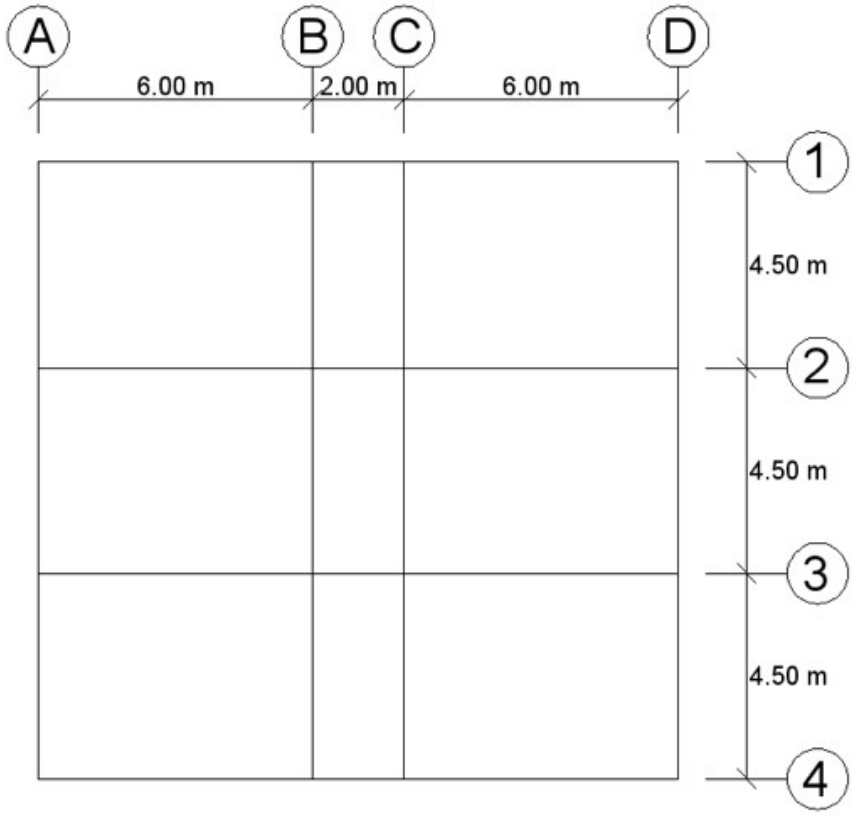
$Z = 0.40$

$N_v = 1.60$

Column Size:



Framing Plan:



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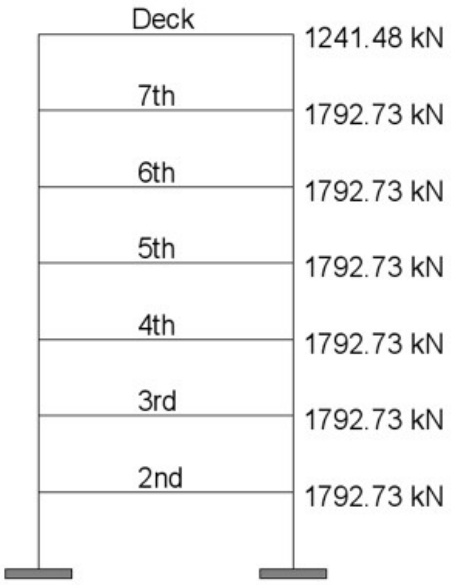


What is the factor "F" for frame C (North to South direction)?

- ○ 0.29725
- ◉ 0.25675
- ○ 0.27325
- ○ 0.26125

Question 19

1 pts

The framing plan of a concrete SMRF building is shown below. If the total height of the structure is 21 meters (3 meters per level), compute the displacements for both N-S and W-E direction (in each levels). Use column A-1 as the building reference point. Assume the lateral forces to be acting at the building's least dimension. Columns are located at the intersections of the grid lines.

Column Properties:

$E = 24.84 \times 10^6$ kPa $G = 9.92 \times 10^6$ kPa

Seismic Data:

$C_v = 0.51$

$I = 1.25$

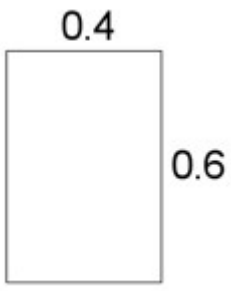
$R = 8.5$

$C_a = 0.38$

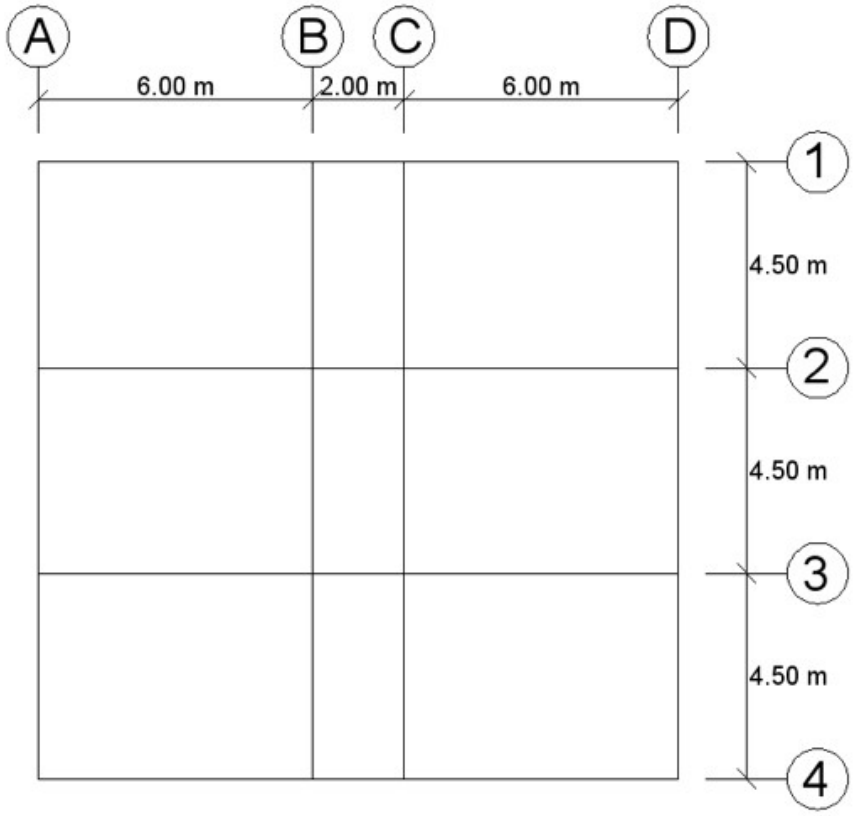
$Z = 0.40$

$N_v = 1.60$

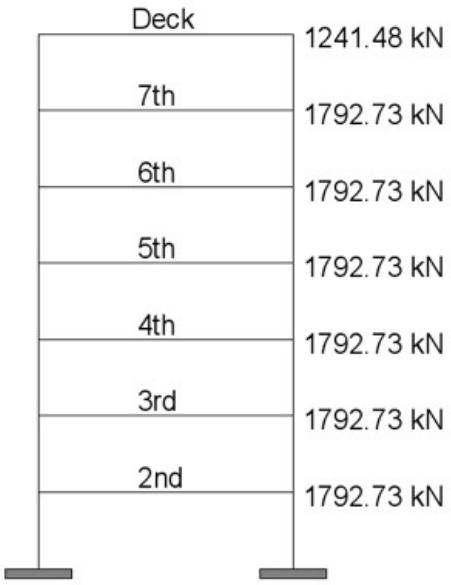
Column Size:



Framing Plan:



Weight per Level:



What is the factor "F" for frame 3 (West to East direction)?

- (●) 0.26500
- ( ) 0.28500
- ( ) 0.29500
- ( ) 0.27500

Question 20

1 pts

The framing plan of a concrete SMRF building is shown below. If the total height of the structure is 21 meters (3 meters per level), compute the displacements for both N-S and W-E direction (in each levels). Use column A-1 as the building reference point. Assume the lateral forces to be acting at the building's least dimension. Columns are located at the intersections of the grid lines.

Column Properties:

$E = 24.84 \times 10^6$ kPa $G = 9.92 \times 10^6$ kPa

Seismic Data:

$C_v = 0.51$

$I = 1.25$

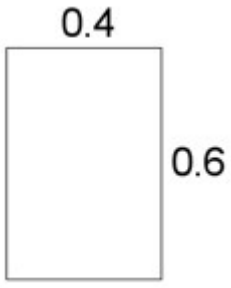
$R = 8.5$

$C_a = 0.38$

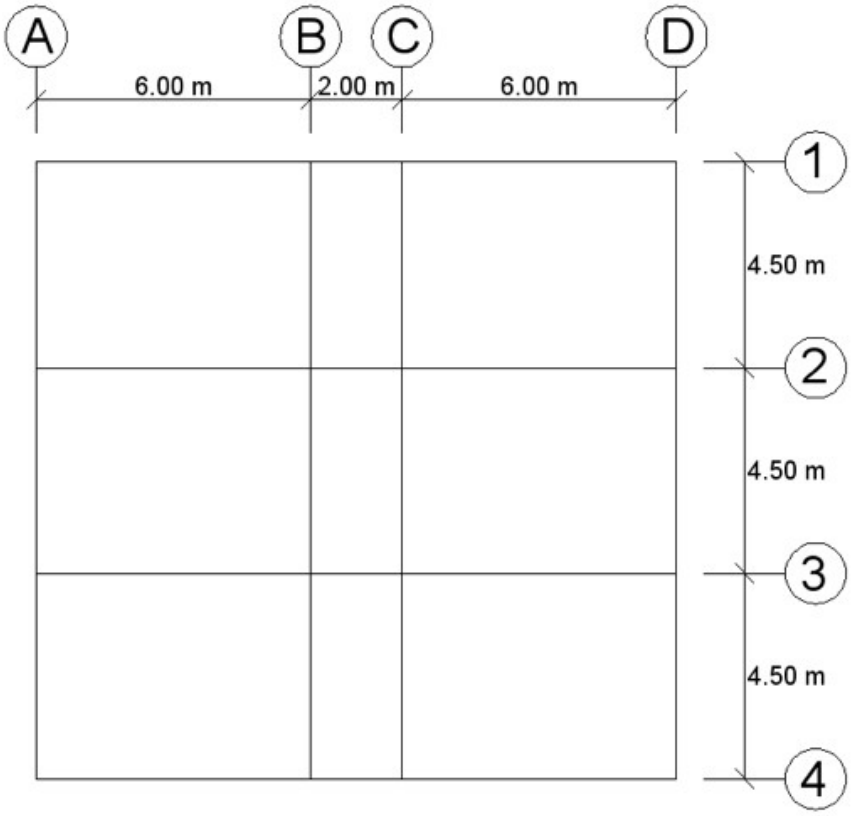
$Z = 0.40$

$N_v = 1.60$

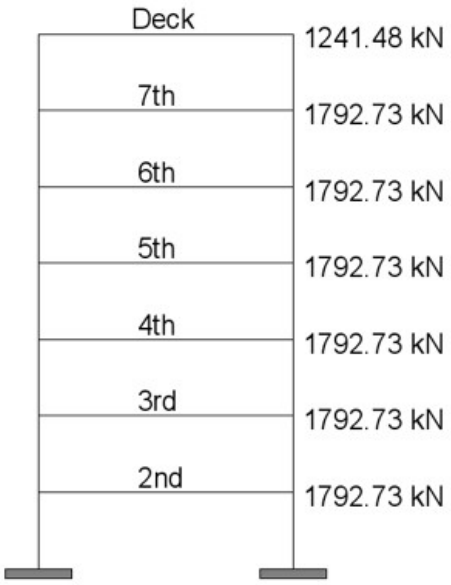
Column Size:



Framing Plan:



Weight per Level:



What is the displacement at the 2nd level considering the North to South Direction?

- ○ 2.1 mm
- ○ 2.6 mm
- ○ 1.6 mm
- ◉ 1.1 mm

Quiz saved at 11:22pm

Submit Quiz

Earthquake Engineering
Summative Assessment 5

Question 1 — 1 pts

In horizontal irregularity type 3, Excessive openings in a diaphragm can result in a flexible diaphragm response along with force concentrations and load path deficiencies at the boundaries of the openings. Elements must be provided to transfer the forces into the diaphragm and the structural system

- (●) True
- ( ) False

Question 11 — 1 pts

In horizontal irregularity type 2, the opening and closing deformation response or flapping action of the projecting legs of the building plan adjacent to re-entrant corners can result in concentrated forces at the corner point.

- (●) True
- ( ) False

Question 12 — 1 pts

Torsional irregularity shall be considered to exist when the maximum storey drift, computed including accidental torsion, at one end of the structure transverse to an axis is more than 1.25 times the average of the storey drifts of the two ends of the structure.

- (●) True
- ( ) False

Question 16

1 pts

In horizontal irregularity type 5, The response deformations and load patterns on a system with non-parallel lateral force-resisting elements can have significant differences from that of a regular system.

- (●) True
- ( ) False

Question 17

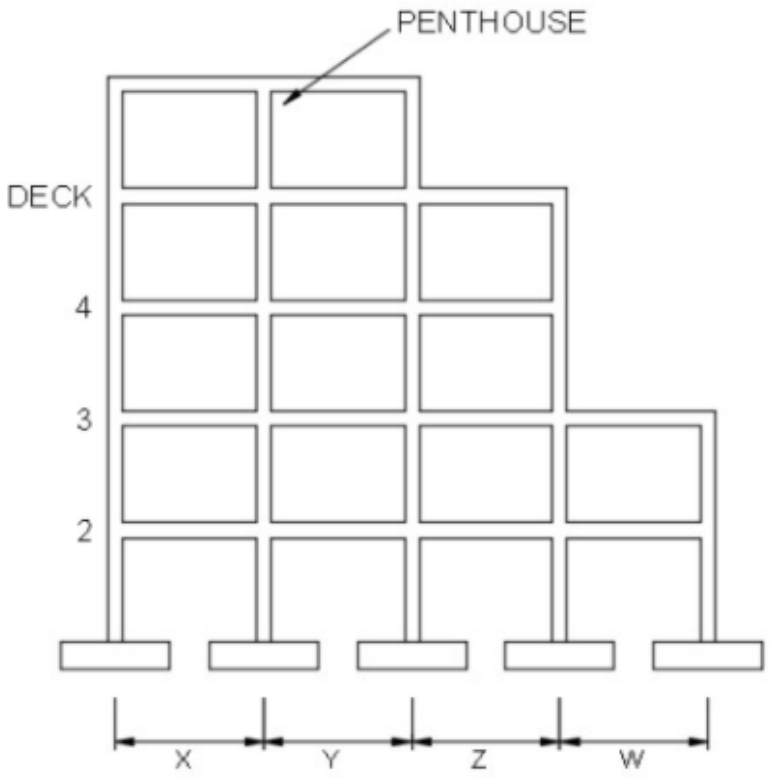
1 pts

In horizontal irregularity type 4, shears and overturning moments must be transferred from the level above the offset, and there is a horizontal "offset" in the load path for the shears.

- (●) True
- ( ) False

Question 2 — 1 pts

The lateral force – resisting system of the four storey special moment frame building is shown below. X = 3m, y = 4m and z = 3.6m.



Which of the following most nearly gives the levels with vertical irregularity type 3 if w = 3m?

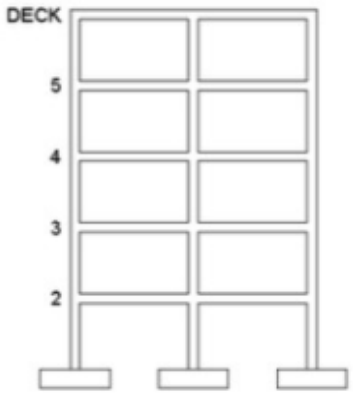
- (●) No vertical type 3 irregularity
- ( ) Penthouse – deck and Level 3 – 4
- ( ) Level 3 – 4 only
- ( ) Penthouse – deck only

Which of the following most nearly gives the maximum value of "w" so that vertical irregularity type 3 will not exist?

- (●) 10.433 ft
- ( ) 9.433 ft
- ( ) 8.433 ft
- ( ) 7.433 ft

Question 3 — 1 pts

A six storey concrete special moment – resisting frame is shown below. The specified lateral forces Fx have been applied and the corresponding storey displacement per floor level have been determined in the ground level equal to zero and the storey displacement at the typical levels is described by equation $y = 2x^{0.75} + 15$ where "y" is the storey displacement per floor level in mm and the "x" is the height per level from the natural grade line (in meters). The height of each level is 3.2 meters. Use 5 decimal places.



Which of the following most nearly gives the storey drift at the 6^{th} level?

- (●) 0.00077
- ( ) 0.00069
- ( ) 0.00054
- ( ) 0.00041

Which of the following most nearly gives the storey drift at the 4^{th} level?

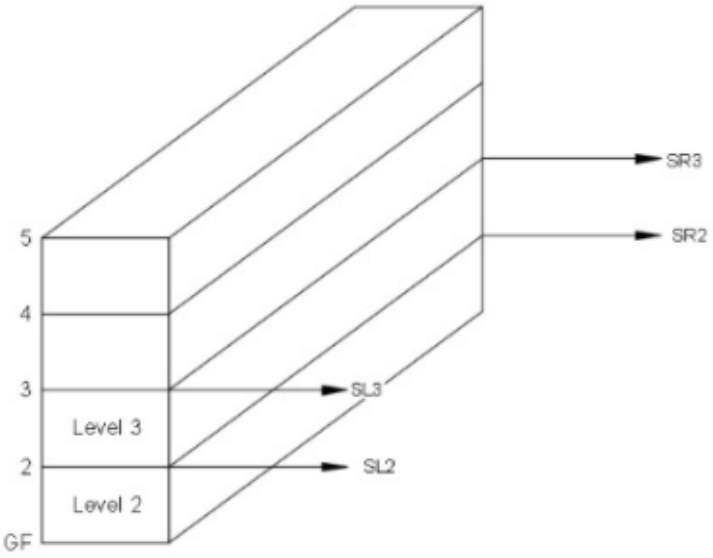
- (●) 0.113 in
- ( ) 0.127 in
- ( ) 0.103 in
- ( ) 0.095 in

Which of the following most nearly gives the level/s with soft storey status?

- (●) Level 2 only
- ( ) Level 3 only
- ( ) Level 2 and 3
- ( ) Level 4, 5, 6 and deck

Question 4 — 1 pts

A four – storey special moment resisting frame building has rigid floor diaphragms. Under specified seismic forces, including the effects of accidental torsion, it has the following displacement at levels 2 and 3. S_{L2} = 28 mm, S_{R2} = 31.5 mm and S_{L3}=32 mm. The maximum storey drift is at the right side of the structure.



Which of the following most nearly gives the value of the governing amplification factor at the third level if the value of SR3 = 37.5 mm?

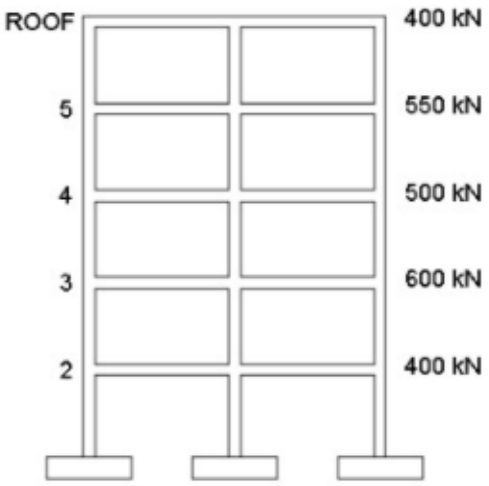
- (●) 1.00
- ( ) 1.10
- ( ) 1.05
- ( ) 0.80

Which of the following most nearly gives the governing eccentricity if the structural dimension is 15m by 14m and the value of SR3 = 60.4mm, ex = 0.50m and ey = 0.60m? Assume the lateral force acting on the least dimension of the structure.

- (●) 0.84 m
- ( ) 0.70 m
- ( ) 0.60 m
- ( ) 0.50 m

Question 5 — 1 pts

The five storey special moment frame office building has a heavy utility equipment installation at level 3. This results in the floor weight distribution shown below. Set of equipment weighing 1/3 of the 3rd floor weight was installed in the 3rd level.



Which of the following most nearly gives the minimum weight of additional equipment to be installed at the 4th level so that type 2 vertical irregularity will not exist considering the applied equipment at the 3rd level?

- (●) 33.3 kN
- ( ) 32.3 kN
- ( ) 34.2 kN
- ( ) 35.3 kN

Which of the following most nearly gives the level/s (adjacent levels only) that will have type 2 vertical irregularity considering the weight at the 5th level?

- (●) Type 2 vertical irregularity does not exist
- ( ) Level 3 and 4
- ( ) Level 3 only
- ( ) Level 4 only

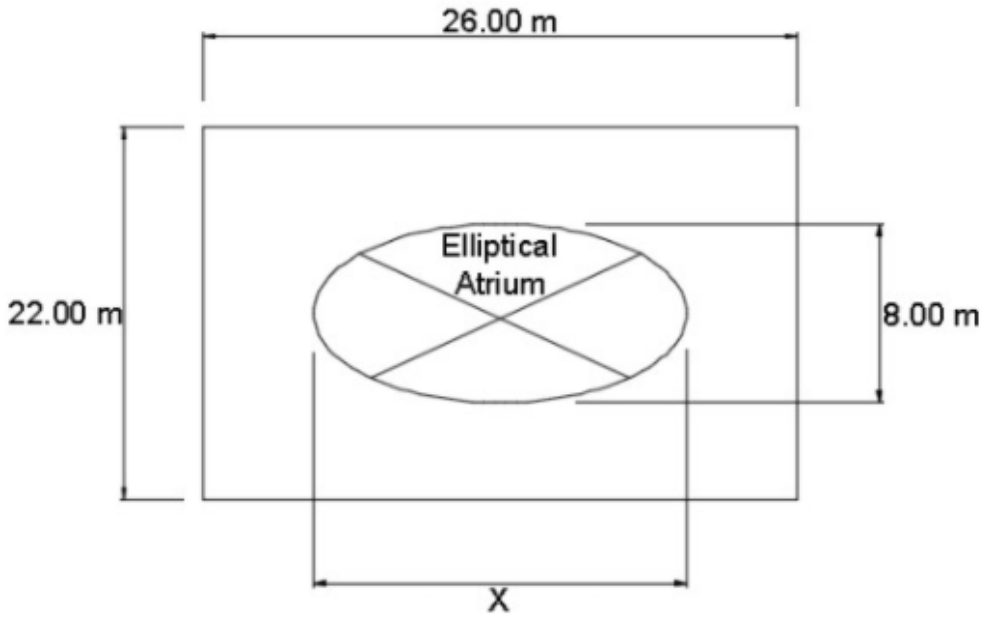
Which of the following most nearly gives the minimum weight of additional equipment to be installed at the 2nd level so that type 2 vertical irregularity will not exist considering the applied equipment at the third level?

- (●) 133.3 kN
- ( ) 132.3 kN
- ( ) 135.3 kN
- ( ) 134.3 kN

Question 6

1 pts

A five – storey concrete building has a bearing wall system located around the perimeter of the building. Lateral forces are resisted by the bearing walls acting as shear walls. The floor plan of the second floor of the building Is shown below. The open area in the diaphragm is for an atrium. All diaphragms above the second floor are without significant openings.



Which of the following most nearly gives the maximum ratio of the deflection of the 2nd level to that of the 3rd level so that horizontal irregularity type 3 will not exist?

- (●) 1.500
- ( ) 0.667
- ( ) 1.250
- ( ) 0.0800

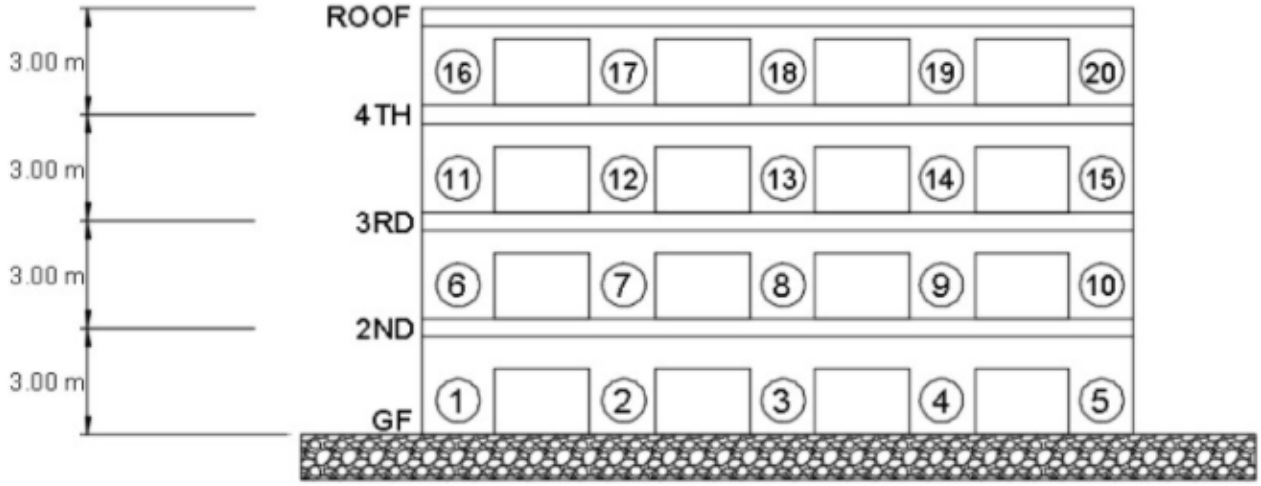
Which of the following most nearly gives the maximum value of "x" so that plan irregularity type 3 will not exist?

- (●) 22.8 m
- ( ) 45.5 m
- ( ) 37.5 m
- ( ) 19.8 m

Question 14

1 pts

A concrete bearing wall building has the typical transverse shear wall configuration shown below. All walls in this direction are identical and the individual piers have the shear contribution given below.



PIER	Vn (kN)	Vm (kN)	PIER	Vn (kN)	Vm (kN)
1	15	25	5	31	32
2	20	18	6	35	30
3	20	22	7	29	35
4	24	30	8	21	18
9	15	16	15	16	25
10	36	27	16	27	30
11	30	40	17	34	27
12	25	20	18	38	29
13	36	31	19	16	25
14	-	-	20	32	19

Which of the following most nearly gives the strength of the second storey?

- (●) 108 kN
- ( ) 129 kN
- ( ) 110 kN
- ( ) 127 kN

Which of the following most nearly gives the strength of the third storey?

- (●) 119 kN
- ( ) 143 kN
- ( ) 136 kN
- ( ) 126 kN

Question 18 — 1 pts

The plan configuration of a ten – storey special moment frame building is a shown below.

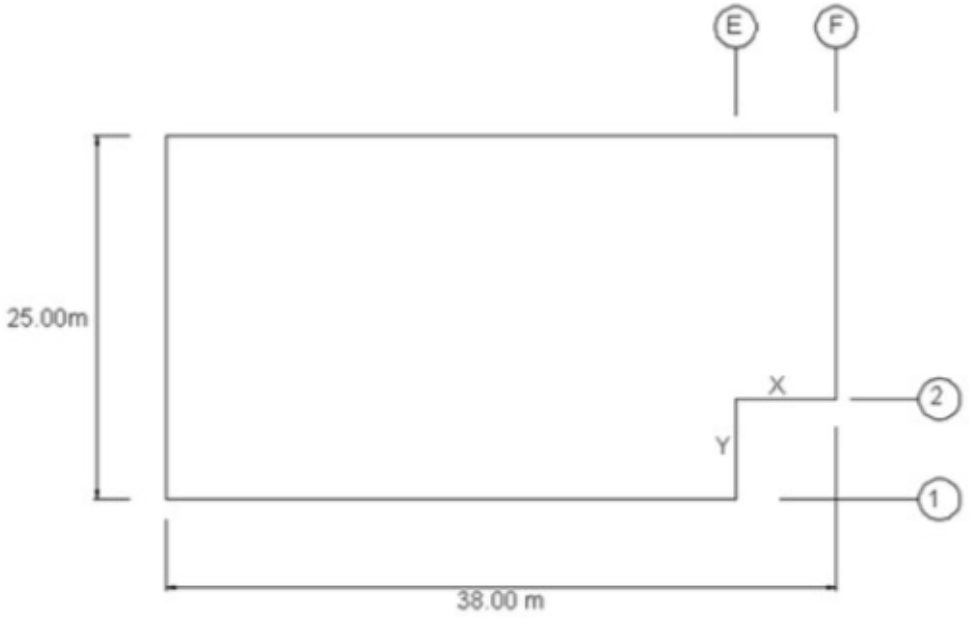


Figure A

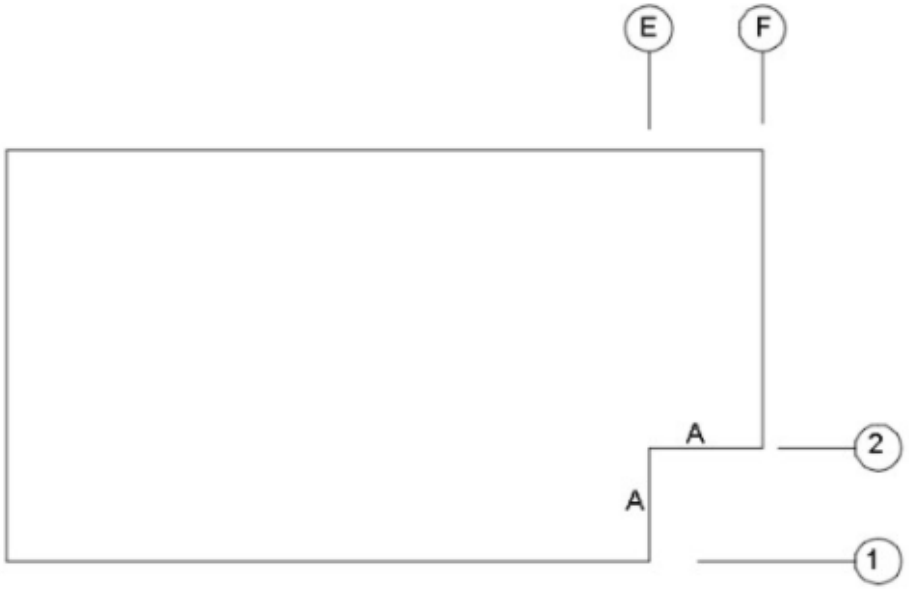


Figure B

Which of the following most nearly gives the maximum area of the re – entrant corner in figure A so that plan irregularity type 3 will not exist?

- (●) 21.375 sq.m.
- ( ) 22.375 sq.m.
- ( ) 23.375 sq.m.
- ( ) 24.375 sq.m.

Earthquake Engineering
Formative Assessment 2

Question 1 1 pts

The new City Sanitarium is to be constructed in Valenzuela City. After conducting soil tests, the underlying soil of the location of the new sanitarium was found out that has a stiff soil profile. The structure is located 7 km from the nearest source that is capable of producing a Magnitude 6.5 earthquake. Determine the percentage of the additional force at the top level of the structure with respect to the maximum value of the force at the top level if it will be made of concrete SMRF, a total height of 21 meters and a total weight of 23,456.50 kN

- ○ 21.1%
- ○ 22.1%
- ◉ 20.1%
- ○ 23.1%

Question 2 1 pts

The new City Sanitarium is to be constructed in Valenzuela City. After conducting soil tests, the underlying soil of the location of the new sanitarium was found out that has a stiff soil profile. The structure is located 7 km from the nearest source that is capable of producing a Magnitude 6.5 earthquake. Determine the ratio of the additional force at the top level of the structure to the maximum allowable (force at the top) if it will be made of concrete SMRF, a total height of 21 meters and a total weight of 23,456.50 kN.

- ○ 25%
- ◉ 20%
- ○ 16.67%
- ○ 33.33%

Question 3 1 pts

A 4-storey with Roof deck AFP armory is to be constructed in Sulu. The facility is essential for the housing of the Philippine Army's newly purchased weapons, ammunitions and explosives. The location of the facility is 7.5 km from the known source which is capable of producing a magnitude 6.7 earthquake. The structure is a Steel MRF with an overall height of 14m from the NGL. The weight per level of the slabs and stairs is equal to 1740 kN. For the walls at the typical levels, the weight is computed as 2362.5 kN and for the parapet at the roof deck level, the weight is computed as 388.8 kN. An equipment 2.0 meters high with a hexagonal cross - sectional area whose sides equal to 1 meter is installed at the second level and has a weight of 100 kPa. Using R = 8.5, which of the following most nearly gives the maximum design base shear in kN? Use Soil Type A.

- ○ 1739 kN
- ○ 1749 kN
- ○ 1759 kN
- ◉ 1729 kN

Question 4 — 1 pts

A 6 - storey with roof deck building has a total height of 21m. The computed base shear is 900 kN. Each floor has an average height of 3.5m. Each floor has a weight of 3500 kN except for the top most level with a weight of 2500 kN. Its natural period of oscillation is 0.75 sec. What is the shear at the 6th level?

- ○ 230 kN
- ○ 224 kN
- ○ 227 kN
- ◉ 221 kN

Question 5 — 1 pts

A 6 - storey with roof deck building has a total height of 21m. The computed base shear is 900 kN. Each floor has an average height of 3.5m. Each floor has a weight of 3500 kN except for the top most level with a weight of 2500 kN. Its natural period of oscillation is 0.75 sec. What is the value of the force at the top?

- ◉ 47.25 kN
- ○ 53.75 kN
- ○ 49 kN
- ○ 50.5 kN

Question 6 — 1 pts

The new City Sanitarium is to be constructed in Valenzuela City. After conducting soil tests, the underlying soil of the location of the new sanitarium was found out that has a stiff soil profile. The structure is located 7 km from the nearest source that is capable of producing a Magnitude 6.5 earthquake. Determine the additional force at the top level of the structure if it will be made of concrete SMRF, a total height of 21 meters and a total weight of 23,456.50 kN.

- ○ 140.5 kN
- ○ 136.5 kN
- ○ 142.5 kN
- ◉ 138.5 kN

Question 7 — 1 pts

A 4-storey with Roof deck AFP armory is to be constructed in Sulu. The facility is essential for the housing of the Philippine Army's newly purchased weapons, ammunitions and explosives. The location of the facility is 7.5 km from the known source which is capable of producing a magnitude 6.7 earthquake. The structure is a Steel MRF with an overall height of 14m from the NGL. The weight per level of the slabs and stairs is equal to 1740 kN. For the walls at the typical levels, the weight is computed as 2362.5 kN and for the parapet at the roof deck level, the weight is computed as 388.8 kN. An equipment 2.0 meters high with a hexagonal cross - sectional area whose sides equal to 1 meter is installed at the second level and has a weight of 100 kPa. Using R = 8.5, which of the following most nearly gives the total lateral force at the deck level in kN? Use Soil Type A.

- ○ 357 kN
- ○ 354 kN
- ○ 349 kN
- ◉ 314 kN

Question 8

1 pts

A 4-storey with Roof deck AFP armory is to be constructed in Sulu. The facility is essential for the housing of the Philippine Army's newly purchased weapons, ammunitions and explosives. The location of the facility is 7.5 km from the known source which is capable of producing a magnitude 6.7 earthquake. The structure is a Steel MRF with an overall height of 14m from the NGL. The weight per level of the slabs and stairs is equal to 1740 kN. For the walls at the typical levels, the weight is computed as 2362.5 kN and for the parapet at the roof deck level, the weight is computed as 388.8 kN. An equipment 2.0 meters high with a hexagonal cross - sectional area whose sides equal to 1 meter is installed at the second level and has a weight of 100 kPa. Using R = 8.5, which of the following most nearly gives the lateral force at the 3rd level in kN? Use Soil Type A.

- ○ 318 kN
- ◉ 303 kN
- ○ 308 kN
- ○ 313 kN

Question 9

1 pts

A 4-storey with Roof deck AFP armory is to be constructed in Sulu. The facility is essential for the housing of the Philippine Army's newly purchased weapons, ammunitions and explosives. The location of the facility is 7.5 km from the known source which is capable of producing a magnitude 6.7 earthquake. The structure is a Steel MRF with an overall height of 14m from the NGL. The weight per level of the slabs and stairs is equal to 1740 kN. For the walls at the typical levels, the weight is computed as 2362.5 kN and for the parapet at the roof deck level, the weight is computed as 388.8 kN. An equipment 2.0 meters high with a hexagonal cross - sectional area whose sides equal to 1 meter is installed at the second level and has a weight of 100 kPa. Using R = 8.5, which of the following most nearly gives the weight at the 2nd level? Use Soil Type A.

- ○ 4373 kN
- ◉ 4363 kN
- ○ 4368 kN
- ○ 4378 kN

Question 10

1 pts

A 4-storey with Roof deck AFP armory is to be constructed in Sulu. The facility is essential for the housing of the Philippine Army's newly purchased weapons, ammunitions and explosives. The location of the facility is 7.5 km from the known source which is capable of producing a magnitude 6.7 earthquake. The structure is a Steel MRF with an overall height of 14m from the NGL. The weight per level of the slabs and stairs is equal to 1740 kN. For the walls at the typical levels, the weight is computed as 2362.5 kN and for the parapet at the roof deck level, the weight is computed as 388.8 kN. An equipment 2.0 meters high with a hexagonal cross - sectional area whose sides equal to 1 meter is installed at the second level and has a weight of 100 kPa. Using R = 8.5, which of the following most nearly gives the lateral force at the 2nd level in kN? Use Soil Type A.

- ○ 156 kN
- ◉ 161 kN
- ○ 151 kN
- ○ 166 kN

Question 11 1 pts

Occupancy Category: Churches, Mosques and other Religion Facilities.

- ○ Standard Occupancy Structures
- ○ Essential Facilities
- ○ Hazardous Facilities
- ◉ Special Occupancy Structures

Question 12 1 pts

The total _____ in a given direction shall be determined from the following equation:

$$V = \frac{3C_a}{R}W$$

- ○ Design Base Shear
- ○ Vertical Distribution
- ○ Simplified Static
- ◉ Simplified Static Force Procedure

Question 13 1 pts

The Philippine Archipelago is divided into two seismic zones only.

- ◉ True
- ○ False

Question 14 1 pts

Occupancy Category: Mental hospitals, sanitariums, jails, prisons and other buildings where personal liberties of inmates are similarly restrained.

- ○ Standard Occupancy Structures
- ○ Hazardous Facilities
- ◉ Special Occupancy Structures
- ○ Essential Facilities

Question 15 1 pts

Occupancy Category: Structures and shelters in emergency preparedness centers.

- ○ Special Occupancy Structures
- ○ Standard Occupancy Structures
- ○ Hazardous Facilities
- ◉ Essential Facilities

Earthquake Engineering
Formative Assessment 3

Question 1

A 4-storey with roof deck were presented in the figure. Using the following values:

A. Beam/Column Sizes

- EB/SB = 0.25m x 0.40m
- Joist = 0.25m x 0.50m
- Girder = 0.35m x 0.60m
- Column = 0.40m x 0.40m

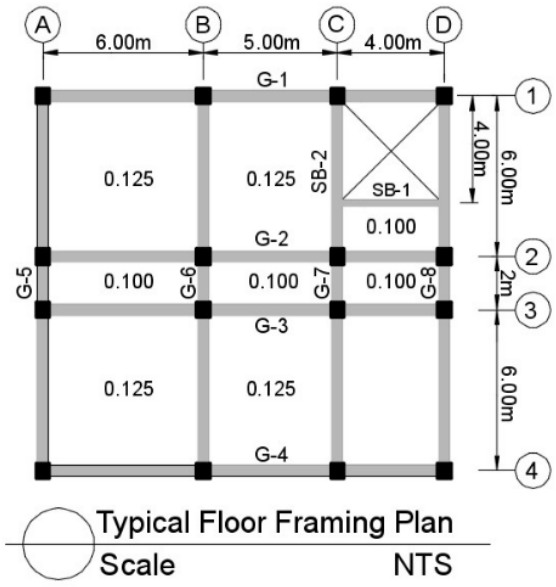
B. Design Loads

- Parapet/Wall = 2.70 kPa
- Superimposed DL = 1.60 kPa
- Unit Weight of Concrete = 24 kN/m^3
- Height of Wall = 3.2m
- Height of Parapet = 1.5m
- Stairs = 5 kPa

C. Perimeter of the walls in the typical level = 108m

D. Perimeter of the walls at the deck level = 12m

E. Perimeter of the parapet in the deck level = 50m



What is the total weight of the girders in the deck level?

- 501.66 kN
- 481.66 kN
- 491.66 kN
- ◉ 471.66 kN

What is the total weight of the walls in the deck level?

- ◉ 570.24 kN
- 580.24 kN
- 600.24 kN
- 590.24 kN

What is the total weight of the columns in the typical levels?

- ◉ 196.608 kN
- 226.608 kN
- 216.608 kN
- 206.608 kN

What is the total weight in the 2nd level?

- 2678.19 kN
- ◉ 2478.19 kN
- 2778.19 kN
- 2578.19 kN

What is the total weight of the structure?

- 9954.07 kN
- 9854.07 kN
- ◉ 9654.07 kN
- 9754.07 kN

What is the total weight of the slabs in the deck level?

- 529.2 kN
- 549.2 kN
- 539.2 kN
- ◉ 559.2 kN

What is the total weight in the 3rd level?

- 2678.19 kN
- 2778.19 kN
- ◉ 2478.19 kN
- 2578.19 kN

Question 2

A 4-storey with roof deck structural steel has the following minimum design loads from the NSCP:

A. Dead Load (DL)

1. 0.125m THK slab = 3.00 kPa
2. 0.050m THK Lean Concrete = 1.20 kPa
3. Marble = 1.58 kPa
4. Gypsum Board = 0.04 kPa
5. Suspended Steel Chanel = 0.10 kPa
6. Beam/Column = 1.00 kPa

Total = 7.92 kPa (with Movable Partition)

B. $W_{walls/parapet}$ = 2.70 kPa

C. Height of Walls and Parapet = 3.6m/1.5m

D. Tributary Area = 210 sq.m

E. P_{walls} = 108m (Typical Levels)

F. P_{walls} = 12m (Deck Levels)

G. $P_{parapet}$ = 50m (Deck Levels)

- ○ 10746.10 kN
- ○ 10946.10 kN
- ◉ 10646.10 kN
- ○ 10846.10 kN

What is the weight of the walls below deck level?

- ◉ 524.88 kN
- ○ 504.88 kN
- ○ 534.88 kN
- ○ 514.88 kN

What is the total weight in the 3rd level?

- ○ 2678.19 kN
- ○ 2778.19 kN
- ◉ 2478.19 kN
- ○ 2578.19 kN

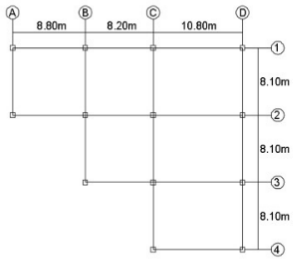
What is the total weight in the 3rd level?

- ○ 2678.19 kN
- ○ 2778.19 kN
- ◉ 2478.19 kN
- ○ 2578.19 kN

Question 11

1 pts

The framing plan of a two-storey post tensioned structure is shown below. Due to some issues, the owner suggest to change the corner columns to equivalent circular columns of the same section modulus as the initial square columns designated as shown in the figure. The size of the square columns is 0.50 by 0.50m. Height per level is 3.60 meters. E = 24.84 x 10^6 kPa and G = 9.92 x 10^6 kPa. Use column A-1 as building reference point. Assume the lateral force is acting from north to south direction. Considering the framing plan below as a typical floor framing plan: Set your calculator to 5 decimal places.



Determine the stiffness for column 2-B.

- ◉ 37.4
- ○ 35.6
- ○ 32.5
- ○ 31.5

Determine the stiffness for column 2-B.

- ◉ 37.4
- ○ 35.6
- ○ 32.5
- ○ 31.5

Determine the stiffness for column D-1.

- ○ 31.5
- ○ 32.5
- ◉ 37.4
- ○ 35.6

Determine the stiffness for column B-1.

- ○ 37.4
- ◉ 31.5
- ○ 35.6
- ○ 32.5

Determine the stiffness for column C-4.

- ○ 35.6
- ◉ 37.4
- ○ 31.5
- ○ 32.5

Determine the stiffness for column 3-D.

- ○ 37.4
- ○ 32.5
- ◉ 31.5
- ○ 35.6

Determine the stiffness for column D-2.

- ○ 37.4
- ◉ 31.5
- ○ 35.6
- ○ 32.5

Determine the stiffness for column C-2.

- ○ 35.6
- ○ 37.4
- ◉ 31.5
- ○ 32.5

Determine the stiffness for column 1-D.

- ○ 32.5
- ◉ 37.4
- ○ 31.5
- ○ 35.6

Determine the stiffness for column 1-A.

- ○ 32.5
- ○ 31.5
- ○ 35.6
- ◉ 37.4

What is the compressive strength used in psi considering that it is a normal weight concrete?

- ◉ 4050 psi
- ○ 3750 psi
- ○ 3250 psi
- ○ 3550 psi

Question 1

1 pts

A single storey building has a roof diaphragm. Shear walls resists lateral forces at both directions. The mass of the roof can be considered to be uniformly distributed, and in this example, the weight of the wall is neglected. In actual practice, particularly with concrete shear walls, the weight of the walls should be included in the determination of the center of mass (CM). The following information is given:

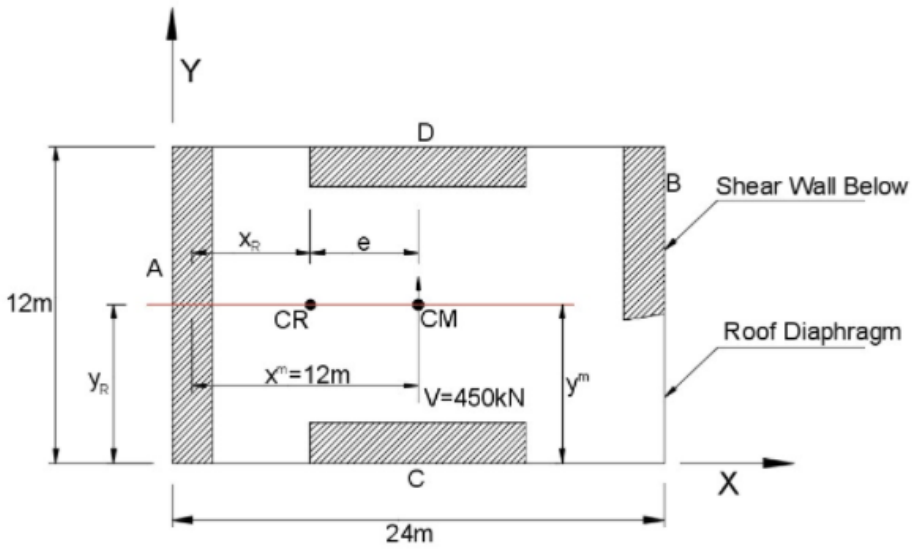
Design base shear: $V = 450$ kN

Wall Rigidities: $R_A = 54$ kN/mm

$R_B = 18$ kN/mm

$R_C = R_D = 36$ kN/mm

Center of Mass: $x_m = 12$m, $y_m = 6$m



What is the initial total shear at A?

- 256.625 kN
- 236.625 kN
- 266.625 kN
- 246.625 kN

What is the initial torsional shear at A?

- 83.875 kN
- 97.875 kN
- 92.875 kN
- 70.875 kN

Accidental torsion amplification factor.

- 1.37
- 1.17
- 1.47
- 1.27

What is the value of the eccentricity?

- 6m
- 8m
- 5m
- 7m

What is the center of rigidity at the y-direction?

- (●) 6m
- ( ) 5m
- ( ) 8m
- ( ) 7m

What is the value of the direct shear in Wall B?

- ( ) 337.5 kN
- (●) 112.5 kN
- ( ) 300.5 kN
- ( ) 255.5 kN

Question 4 — 1 pts

Horizontal Distribution of Shear: The design storey shear, V_x in any storey is the sum of the forces F_t and F_x above that storey.

- (●) True
- ( ) False

Question 6 — 1 pts

Horizontal Torsional Moments: In the equation below, δ_{avg} = the maximum displacement at Level x, mm

$$A_x = \left[\frac{\delta_{max}}{1.2\delta_{avg}}\right]^2$$

- (●) False
- ( ) True

Question 9 — 1 pts

Horizontal Distribution of Shear: V_x shall be distributed to the various elements of the vertical lateral force-resisting system in proportion to their rigidities, considering the rigidity of the diaphragm.

- ( ) False
- (●) True

Question 10 — 1 pts

Horizontal Torsional Moments: The torsional design moment at a given storey shall be the moment resulting from eccentricities between applied design lateral forces at levels above that storey and the vertical-resisting elements in that storey plus an accidental torsion.

- (●) True
- ( ) False

Question 11 — 1 pts

The framing plan of a concrete SMRF building is shown below. If the total height of the structure is 21 meters (3 meters per level), compute the displacements for both N-S and W-E direction (in each levels). Use column A-1 as the building reference point. Assume the lateral forces to be acting at the building's least dimension. Columns are located at the intersections of the grid lines.

Column Properties:

$E = 24.84 \times 10^6$ kPa $G = 9.92 \times 10^6$ kPa

Seismic Data:

$C_v = 0.51$

$I = 1.25$

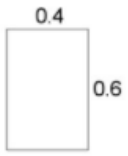
$R = 8.5$

$C_a = 0.38$

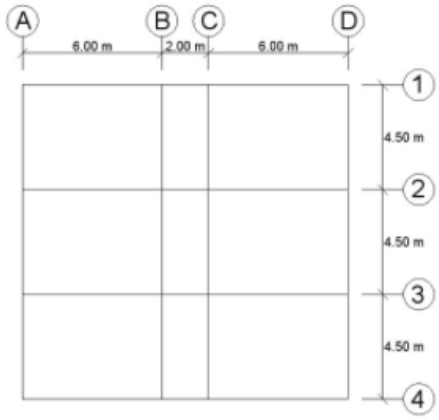
$Z = 0.40$

$N_v = 1.60$

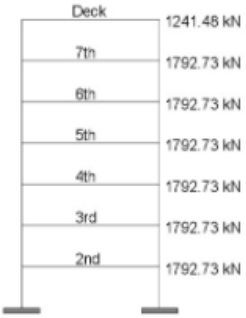
Column Size:



Framing Plan:



Weight per Level:



What is the stiffness of frame 2 (West to East Direction)?

- ○ 164 kN
- ○ 154 kN
- ○ 144 kN
- ◉ 134 kN

What is the stiffness of frame 1 (West to East Direction)?

- ○ 154 kN
- ○ 164 kN
- ○ 144 kN
- ◉ 134 kN

What is the lateral force at the deck level (vertical distribution)?

- ○ 376.5 kN
- ◉ 286.5 kN
- ○ 296.5 kN
- ○ 306.5 kN

What is the lateral force at the 2nd level (vertical distribution)?

- ◉ 46.1 kN
- ○ 56.1 kN
- ○ 66.1 kN
- ○ 36.1 kN

What is the factor "F" for frame A (North to South direction)?

- ○ 0.28235
- ○ 0.27125
- ◉ 0.29725
- ○ 0.25675

What is the governing design base shear?

- ○ 1285 kN
- ○ 1275 kN
- ◉ 1255 kN
- ○ 1265 kN

What is the stiffness of frame A (North to South Direction)?

- ◉ 284 kN
- ○ 294 kN
- ○ 274 kN
- ○ 304 kN

What is the total stiffness of the columns in the west to east direction?

- ○ 547 kN
- ○ 527 kN
- ○ 517 kN
- ◉ 537 kN

What is the lateral force at the 3rd level (vertical distribution)?

- ○ 72.2 kN
- ◉ 92.2 kN
- ○ 82.2 kN
- ○ 102.2 kN

What is the stiffness of frame C (North to South Direction)?

- ○ 294 kN
- ○ 304 kN
- ◉ 284 kN
- ○ 374 kN

Current Score: 20 out of 20

Earthquake Engineering
Formative Assessment 5

Question 1 1 pts

In the equation: M = β(G), what is β?

- ○ Girder Factor
- ○ Girder Moment
- ◉ Girder Constant
- ○ None of the above

Question 2 1 pts

If we consider each bent of the frame to be composed of a series of portals, then the interior columns would represent the effect of two portal columns and would therefore carry thrice the shear V as the two exterior columns.

- ◉ False
- ○ True

Question 3 1 pts

The _____ method is most suitable for buildings having low elevation and uniform framing.

- ○ Standard
- ○ Special
- ○ Essential
- ◉ Portal

Question 4 1 pts

The cantilever method for fixed-supported building frames requires a hinge is placed at the center of each girder, since this is assumed to be a point of double moment.

- ◉ False
- ○ True

Question 5 1 pts

In the mechanics of materials, bending is more important if the beam is_____.

- ○ Shorter
- ○ Softer
- ○ Harder
- ◉ Longer

Question 6 1 pts

In the equation: g = Σ Kc / Σ K , what is Σ Kc?

- ◉ The sum of the K values meeting at that joint
- ○ None of the above
- ○ The sum of all K values for all members of that joint
- ○ Girder Factor

Question 7 1 pts

The cantilever method is based on the same action as a long cantilevered beam subjected to a transverse load.

- ◉ True
- ○ False

Question 8 1 pts

The shear resistance becomes more important in the design of long beams, whereas bending is more important if the beam is short.

- ◉ False
- ○ True

Question 9 1 pts

The Girder Factor is computed as:

- ○ g = β (G)
- ○ g = 1-g
- ○ g = 2-g
- ◉ g = Σ Kc / Σ K

Question 10 1 pts

A building bent deflects in the same way as a portal frame and therefore it would be appropriate to assume inflection points occur at the center of the columns and girders.

- ◉ True
- ○ False

9 out of 10 (1st Attempt)

Question 1 1 pts

A building bent deflects in the same way as a portal frame and therefore it would be appropriate to assume inflection points occur at the center of the columns and girders.

- ◉ True
- ○ False

Question 2 1 pts

The shear resistance becomes more important in the design of long beams, whereas bending is more important if the beam is short.

- ◉ False
- ○ True

Question 3 1 pts

The cantilever method for fixed-supported building frames requires a hinge is placed at the center of each girder, since this is assumed to be a point of double moment.

- ◉ False
- ○ True

Question 4 1 pts

In the equation: g = Σ Kc / Σ K , what is Σ Kc?

- ○ Girder Factor
- ○ The sum of all K values for all members of that joint
- ○ None of the above
- ◉ The sum of the K values meeting at that joint

Question 5 1 pts

In the equation: g = Σ Kc / Σ K , what is Σ K?

- ◉ The sum of all K values for all members of that joint
- ○ None of the above
- ○ The sum of the K values meeting at that joint
- ○ Girder Factor

Question 6 1 pts

If we consider each bent of the frame to be composed of a series of portals, then the interior columns would represent the effect of two portal columns and would therefore carry thrice the shear *V* as the two exterior columns.

- ○ True
- ◉ False

Question 7 — 1 pts

In the equation: g = Σ Kc / Σ K , what is g?

- (●) Girder Factor
- ( ) The sum of the K values meeting at that joint
- ( ) The sum of all K values for all members of that joint
- ( ) None of the above

Question 8 — 1 pts

The Girder Factor is computed as:

- ( ) g = β (G)
- ( ) g = 2-g
- (●) g = Σ Kc / Σ K
- ( ) g = 1-g

Question 9 — 1 pts

The Column Factor is computed as:

- (●) $c = 1 - g$
- ( ) $c = \beta(G)$
- ( ) c = Σ Kc / Σ K
- ( ) $c = 2 - g$

Question 10 — 1 pts

The cantilever method for fixed-supported building frames: The axial stress in a column is proportional to its distance from the centroid of the cross-sectional areas of the columns at a given floor level. Since stress equals force per area, then in the special case of the columns having equal cross-sectional areas, the force in a column is also proportional to its distance from the centroid of the column areas.

- (●) True
- ( ) False

10 out of 10 (2nd Attempt)