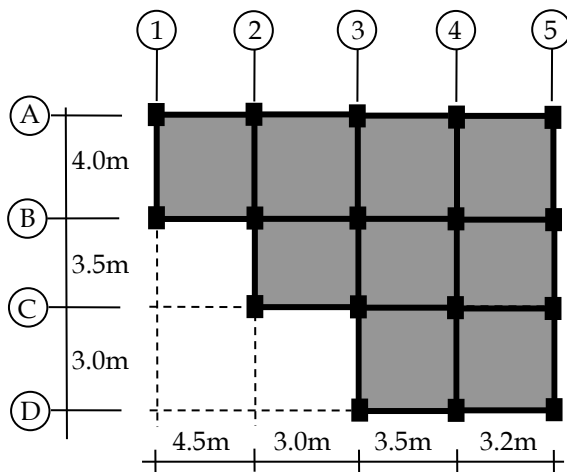


Department of Civil Engineering
Indian Institute of Technology Guwahati
CE 302: Structural Analysis II (2021-2022)
Term Project Sheet :: Group 13

Part I

An eight-storeyed moment-resistant reinforced concrete frame building (without any unreinforced brick masonry infill wall) on rocky ground condition has the following details:

Floor-to-floor height	: 3.3 m
Height of foundation storey	: 3.3 m
Thickness of floor slabs and roof slab	: 125 mm
Size of beam	: 230 mm × 400 mm
Size of column	: 500 mm × 500 mm
Grade of concrete	: M30
Live load on roof	: 1.5 kPa
Live load on floor	: 4.0 kPa
Load combinations	: (a) $1.5 DL + 1.5 LL$, (b) $1.2 DL + 1.2 LL + 1.2 HL$ (DL , LL and HL are the dead load, live load and the horizontal load)



Level	Total Horizontal Force (kN)
Roof	155
Seventh floor	135
Sixth floor	115
Fifth floor	90
Fourth floor	65
Third floor	40
Second floor	25
First floor	15
Ground floor	10

- Model the entire building in SAP2000 by (i) considering beams and columns as frame members and (ii) considering only the load distribution from slabs (*do not model the slabs, assign rigid diaphragm constraint for the in-plane stiffness of the slabs*).
- For the mentioned load combinations, obtain the design shear forces and bending moments in the beams and the columns for separate load application along the two directions.
- For the mentioned load combinations, show the locations of the members (along with the member number in the model) where the design forces and moments are observed.
- Considering the frame along Gridline (3), obtain the member end moments of the beams and the columns using moment distribution method, for the load combination (1). Compare the member moment values (for *any two beams and any two columns at any level*) with those obtained from SAP2000 results.

Documents to be submitted:

- Only the .sdb file of the SAP2000 model (no other accessory file),
- MS Excel file showing the shear force and bending moment output values (*along with marking of the design shear force and design bending moment*), and
- load calculations and any other explanation (*soft copy or hard copy*)

Date of submission: 02 October 2021

Part II

A three storied moment-resistant reinforced concrete frame building, without unreinforced brick masonry infill walls, has the same (a) building plan, (b) overall dimensions, (c) section sizes of the beams, columns and the slabs, (d) the grade of concrete, and (e) the live loads on the floors and the roof, as the building in Part I. The lateral loads at the different floor levels are shown in the table below:

Level	Total Horizontal Force (kN)
Roof floor	70
Second floor	45
First floor	30
Ground floor	10

- (a) Model the entire building in SAP2000 by (i) considering beams and columns as frame members and (ii) considering only the load distribution from slabs (*do not model the slabs*).
- (b) For the same load combinations as mentioned in Part I, obtain the design shear forces and bending moments in the beams and the columns for separate load application along the two directions.
- (c) Write a computer program in any language (preferably in MATLAB) for analyzing the same frame, using stiffness matrix method.
- (d) Compare the results of the MATLAB program output with those obtained in (b).

Documents to be submitted:

- (a) Only the *.sdb* file of the SAP2000 model (no other accessory file),
- (b) MS Excel file showing the design shear forces and the bending moments,
- (c) load calculations and any other explanation (*soft copy* or *hard copy*),
- (d) soft copy of the program (MATLAB or any language used) and its output, and
- (e) any other file for explaining the program.

Date of submission: 16 November 2021