Ref. No. Ex. Ex/CON/PE/B/TS/424A/2023

B. CONS. ENGG. 4th YR 2ND SEMESTER EXAM.-2023

COMPUTER AIDED STRUCTURAL ANALYSIS AND DESIGN

Time : Four hours | Full Marks : 100

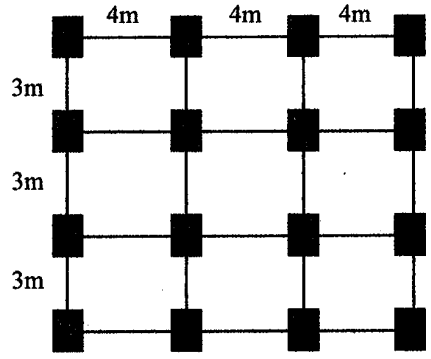
(50 Marks for each Part)

Use separate answer script for each Part

PART I (50 Marks)

Instructions :

Answer All Questions

No of Questions		Marks
Q1.	 As per above mentioned plan you have to generate a 3D model in STAAD of G+8 storied building. Floor to floor to height is 3.2 meters. Define and write generation procedure of geometry of above-mentioned structure in STAAD platform in detail.	30
Q2	Calculation the floor load intensity of above mentioned structure considering following data. i) RCC slab thickness is 125 mm. ii) Floor finish thickness 40 mm. iii) Plaster thickness is 20 mm Write in detail the procedure of define and assign of FLOOR LOAD in STAAD platform.	20

[Turn over

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Bachelor of Construction Engineering 4th Year 2nd Semester Examination, 2023

COMPUTER AIDED STRUCTURAL ANALYSIS AND DESIGN

(BASIC ELECTIVE –II)

PART – II

Maximum Marks: 50

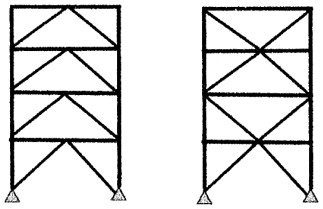
Notes:

1. Attempt all the questions to the best of your knowledge, ability, and understanding.
2. The number on the right side of each question in parenthesis denotes the full marks that can be obtained from each question.
3. Use of IS codes is NOT permitted, however the use of a scientific calculator is allowed.
4. Read the questions carefully before answering, all the answers should be brief and precise.
5. Any other relevant data can be assumed suitably, if required.

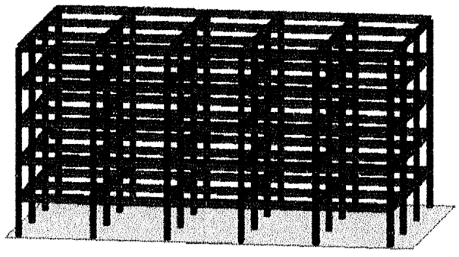
1) Shown below are the images of different structures/ structure diagrams having varied structural forms, *identify* each of the structural forms from the list of forms given below and *write one-two sentences* about the basic characteristics of each structural form.

Structural Forms	Coupled Shear Wall Structure
	Concentrically Braced Frame Structure
	Space Truss Structure
	Rigid Frame Structure

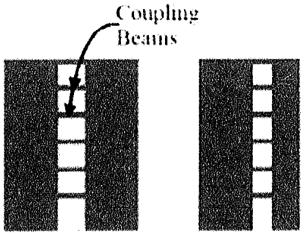
(a)



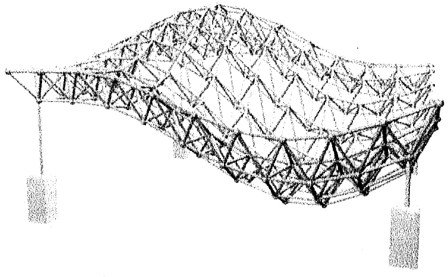
(b)



(c)

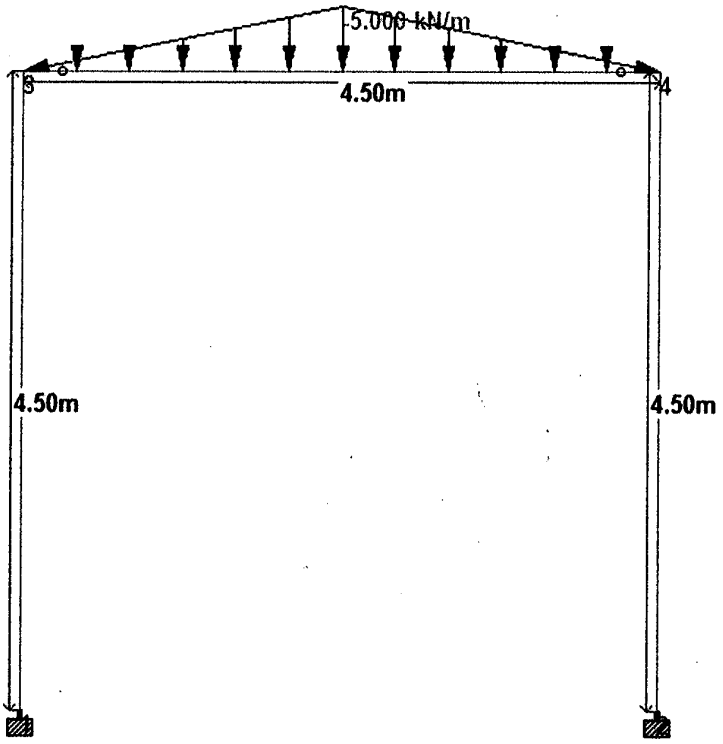


(d)

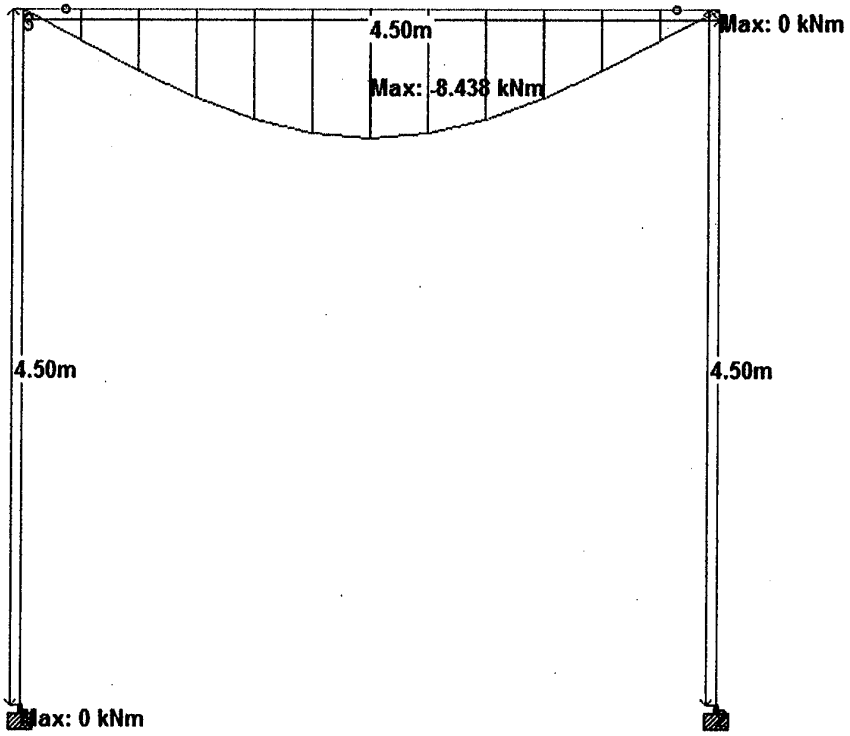


[3 X 4 = 12]

2) Given below the diagram of a RCC frame structure having uniformly varying load in triangular form with its maximum value (w) of 5 kN/sqm acting vertically downwards at the centre of the beam. The junction at the beam and the columns do not transfer any moment and hence can be considered as simply supported. The beam and columns all have a section of 250 mm X 250 mm. Calculate the value of maximum bending moment in the beam.

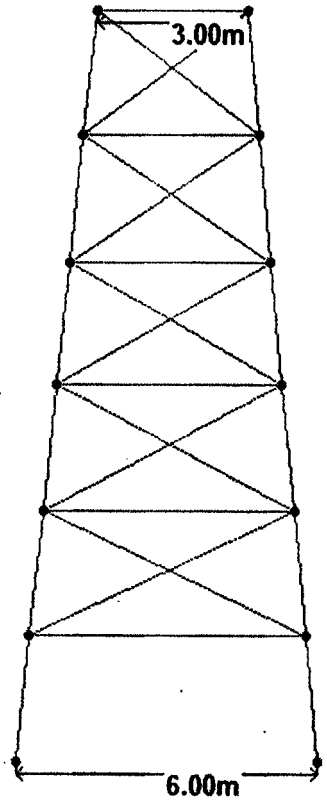


The result obtained from STAAD analysis is shown below. Compare the result with the result obtained from your calculation. Is there any difference? If so, then explain the reason(s) behind it.

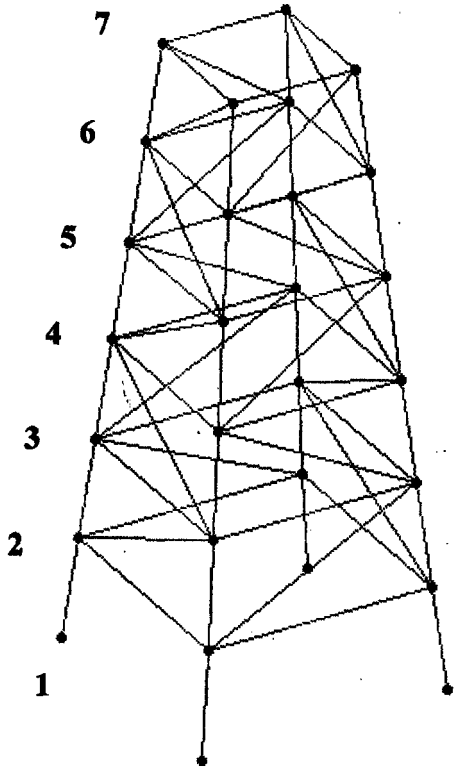


[8 + 4 = 12]

3) Given below the elevation, and isometric view of steel tower situated in Lah, Ladakh where the basic wind speed is considered as 55 m/s. The structure is located at an exposed area with few or no obstruction on a relatively flat surface with upwind slope of 2.75 degrees. The height of each beam level is 2.5 m. Calculate the design wind pressure at the joints 1 - 7. Assume any other data suitably, if required.



Elevation



Isometric View

Table 1: Risk coefficients for different classes of structures in different wind speed zones [*Clause 5.3.1*]

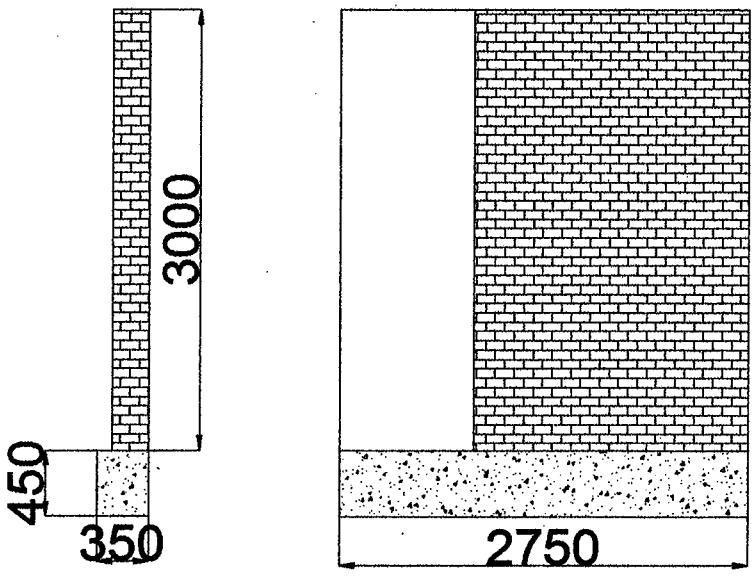
Class of Structure	Mean Probable design life of structure in years	k_1 factor for Basic Wind Speed (m/s) of					
		33	39	44	47	50	55
All general buildings and structures	50	1.0	1.0	1.0	1.0	1.0	1.0
Temporary sheds, structures such as those used during construction operations (for example, formwork and false work), structures during construction stages, and boundary walls	5	0.82	0.76	0.73	0.71	0.70	0.67
Buildings and structures presenting a low degree of hazard to life and property in the event of failure, such as isolated towers in wooded areas, farm buildings other than residential buildings, etc.	25	0.94	0.92	0.91	0.90	0.90	0.89
Important buildings and structures such as hospitals, communication buildings, towers and power plant structures	100	1.05	1.06	1.07	1.07	1.08	1.08

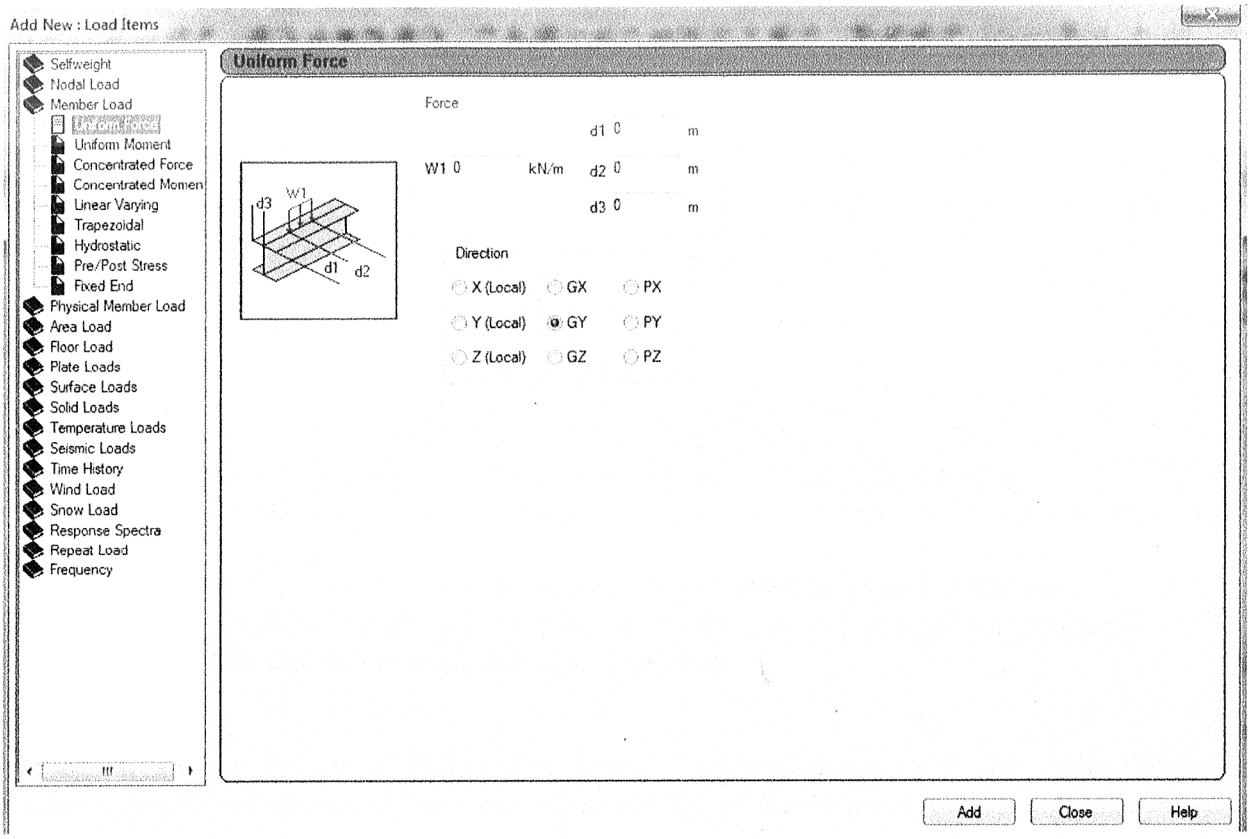
Table 2: **k_2 factors to obtain design wind speed variation with height in different terrains *[Clause 5.3.2.2]***

Height (*z*) *(m)*	Terrain and height multiplier (k_2)			
	Terrain Category 1	Terrain Category 2	Terrain Category 3	Terrain Category 4
10	1.05	1.00	0.91	0.80
15	1.09	1.05	0.97	0.80
20	1.12	1.07	1.01	0.80
30	1.15	1.12	1.06	0.97
50	1.20	1.17	1.12	1.10
100	1.26	1.24	1.20	1.20
150	1.30	1.28	1.24	1.24
200	1.32	1.30	1.27	1.27
250	1.34	1.32	1.29	1.28
300	1.35	1.34	1.31	1.30
350	1.37	1.36	1.32	1.31
400	1.38	1.37	1.34	1.32
450	1.39	1.38	1.35	1.33
500	1.40	1.39	1.36	1.34
NOTE: For intermediate values of height z and terrain category, use linear interpolation.				

[10]

4) Shown below is the side and front view of a brick wall of width 230 mm over a beam of dimension 350 mm X 450 mm. The opening on the wall measures 900 mm. Calculate the parameters of loading (W1, d1, d2, d3) in STAAD.pro interface as shown below. Show detailed calculations. Consider unit weight of brick to be 19.5 kN/m^3.



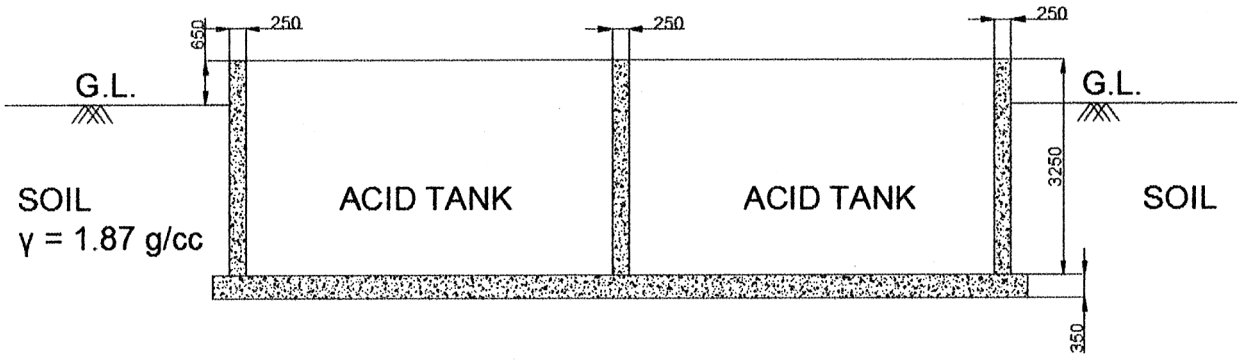


[6]

5) How would you differentiate between a hinged, a roller and a fixed support? Explain your answer in view of a RCC frame structure.

[4]

6) Given below the cross section of an underground Sulphuric Acid tank which has a density of 1.84 g/cc. The free board on the acid tank is 400 mm from the top. Calculate the loads on the wall of the tank considering all possible scenarios.



[6]