Reg. No.



MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL (A constituent unit of MAHE, Manipal)

MANIPAL INSTITUTE OF TECHNOLOGY I SEMESTER M.TECH (STRUCTURAL ENGINEERING) END SEMESTER EXAMINATION, JAN2023 ANALYSIS AND DESIGN OF TALL STRUCTURES (CIE 5127)

(02-12-2023)

TIME: 3 HRS.

MAX. MARKS: 50

Note: 1. Answer all questions.

2. Any missing data may be suitably assumed.

3. Use of IS456 -2000 code is permitted

Q.	QUESTION	MARKS	CO	BL
NO				
1A	Illustrate any two design criteria specifically to structural design of tall	04	1	4
	structures.			
1B	Explain with a neat sketch at tube-in-tube structure.	03	2	3
1C	Illustrate cantilever method to analyze a rigid frame structure.	03	3	4
2	Evaluate the deflection at roof level due to lateral load for a multi-storied	10	3	6
	building given the following details; building has 31 story, each story of 3.5			
	m height, each frame has 4 bays each of 8.5m span. All the beams are 250mm			
	x 1000mm in size and all the columns are 350mm x 1000mm size. Wind			
	pressure at the site may be assumed as 1.5 kN/m^2 . There are 4 Frames spaced			
	at 6m c/c, and 3 shear walls each 200 mm wide and 10m in length. Evaluate			
	also the load shared by frame and shear wall by approximate method. The			
	grade of concrete is M50.			
3 A	Evaluate whether boundary elements are required for a shear wall of width	03	3	6
	300 mm and length 6 m is subjected to factored axial load of 12000kN,			
	factored moment of 10000kN-m and factored shear force of 850 kN. The			
	Grade of concrete is M_{25} and steel is Fe_{500} .			
3B	Evaluate the critical buckling load for ground floor columns of a building	07	4	5
	frame having 9 story and beam span of 4.2m. All the columns have size of			
	230mm x 600 mm and all beams have size of 230 mm x 400 mm, each story			
	height is 4.0m, lateral load/ story is 40 kN. The total live load and gravity			
	load on the floor beam is 50kN/m and that on the roof beam is 30 kN/m.			
	Assume M25 grade concrete.			
4	The plan of the structure is as shown in the Fig.Q4, is of a 70 story 210 m	10	4	6
	high wall-frame structure. The lateral load resistance to wind acting on its			
	longer side is provided by six rigid frames and a central core. It is required			

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	to assess deflections at top and forces in frame and core for a wind loading			
	of 1.2 kN/m ² , consider the wall frame interaction forces, given are the			
	structural data as below:			
	All columns have $Ixx=0.25 \text{ m}^4$ and beams have $Ixx=0.045 \text{m}^4$. The moment			
	of inertia of the core is 400 m4, assume $E=2x10^8$ kN/m ² .			
5A	Illustrate the effects of differential shortening of vertical members in tall	5	5	4
	buildings and way to compensate it during design and construction stage.			
5B	Assess the height from top for chimney of external diameter 7.0 m and shell	5	5	6
	thickness 250mm and 1.2% steel reinforcement, where the windward face			
	stress is zero and evaluate the maximum stress in concrete. The wind			
	pressure at site is 2.0 kN/m ² . The total height of the chimney is 60m from			
	ground level. Materials used are M25 grade concrete and Fe415 grade steel.			
	Also Evaluate the footing size of the chimney required if safe bearing			
	capacity of soil is 250 kN/m^2 .			

