Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

MANIPAL INSTITUTE OF TECHNOLOGY

I SEMESTER M.TECH (STRUCTURAL ENGINEERING)

MAKE UP EXAMINATION, JAN2023

ANALYSIS AND DESIGN OF TALL STRUCTURES (CIE 5127)

(08-01-2024)

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. NO	QUESTION	MARKS	CO	BL
1A	Illustrate the innovative design concepts that has led to decrease in the unit weight of structural framing members.	04	1	4
1B	List the criteria important for structural design of high rise buildings.	03	2	3
1C	Illustrate Portal method to analyze a rigid frame structure.	03	3	4
2	For a 4 story 'K' braced framed structure it is required to determine the drift at all floor levels for a uniform lateral load of 12 kN/story. Assume the elastic modulus as $2x10^5$ N/mm^2. The frame has span L = 5.5 m and each story height of 3.5m. The area of the bracings, columns and beams are 4000mm^2, 25000 mm^2 and 30000mm^2 respectively. Check with the drift limit if the lateral loads are due to wind effects and comment on the results.	10	3	6
3A	Illustrate the difference between portal method and cantilever method of analysis.	03	3	6
3B	For a single outrigger system shown in Fig Q3B. Calculate the forces in the core wall and deflection at the top. If the grade of concrete used is M40. The wind load is 8 kN/m uniform over the entire height of the building. H1=3.5m x 8, H2=3.0m x 25, d=12m, L1=14m, Thickness of core and outrigger =250mm, depth of outrigger=6m. Column area = 1000mm x 1000mm.	07	4	5
4	For a Wall frame structure of 32 story 112 m high. The lateral load resistance to wind acting on its longer side is provided by six rigid frames and a central core. It is required to evaluate deflection at the top, maximum inter-storey drift and the forces in core and frame with wind force of 40 kN/m. by considering the wall frame interaction forces, the structural data given are as below: The average storey shear rigidity GA=14000000 kN. The Constant of integrations C1=-0.009337, C2=0.0003811, C3=0.009337 and C4=-0.00933. All columns have I_{xx}=0.15 m^4 and beams have I_{xx}=0.06m^4. The moment of inertia of the core is 450 m^4, assume E=$2x10^7$ kN/m^2.	10	4	6

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5A	Evaluate the height from top for chimney of external diameter 8 m and shell thickness 200mm and 1.5% steel reinforcement, where the windward face stress is zero. The wind pressure at site is 2.0 kN/m^2. The total height of the chimney is 80m from ground level. Determine the minimum size of foundation required as fully raft circular footing if the safe bearing capacity of soil at site is 200 k/m^2. The grade of concrete is M30 and grade of steel is Fe415.	**5**	**5**	**4**
5B	Evaluated the differential shorting at the top of the structure for two columns each of size 230 mm x 400mm. The total number of storey is 10 and the load from each storey on the column are 200kN and 300kN respectively. The grade of concrete is M20. If the beam size is 200 mm x 600mm and the span is 3 m, evaluate the additional moments in the beam due to differential shortening.	**5**	**5**	**6**

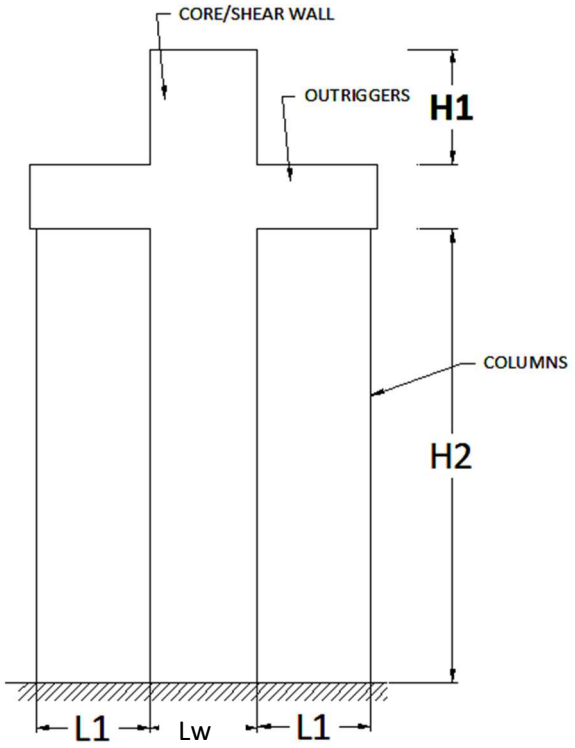

FIG. Q3B