

*Original*

Reg. No.



**MANIPAL INSTITUTE OF TECHNOLOGY**

MANIPAL

(A constituent unit of MAHE, Manipal)

**I SEMESTER M.TECH. (STRUCTURAL ENGINEERING)**

**END SEMESTER EXAMINATION FEBRUARY/MARCH 2021**

**SUBJECT: ANALYSIS AND DESIGN OF TALL STRUCTURES [CIE-5172]**

Time: 3 Hours

Date: 01-03-2021

MAX. MARKS: 50

- ❖ Answer **ALL** the questions. Missing data may be suitably assumed.
- ❖ Use of IS 456 -2000 is permitted

Q.no		Marks	CO'S
1A	Explain any 4 criteria specifically to structural design of tall buildings.	04	CO1
1B	What are the factors that affect the choice of structural form? Discuss with neat sketch at least 3 types of structural forms.	06	CO2
2A	What are the different loads considered in design of tall buildings?	02	CO1
2B	Calculate 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 3.0 kN/m <sup>2</sup> . The total height of the chimney is 70m from ground level. Calculate the stresses in the shell at the base of the chimney. The grade of concrete is M30 and grade of steel is Fe415.	08	CO5
3	For an outrigger braced structure as shown in the Fig.Q3, determine the moment in the core and draw BMD and SFD. The grade of concrete used is M40 for all elements. The size of core is 0.25m x 12 m, size of each outrigger is 0.25m x 5.0m. The lateral wind load is 12kN/m, H1= 3.2m x 6 storey, H2=3.2m x 21 storey, H3= 3.2 m x 25 storey and L1 =12 m, all column sizes are 1.2 m x 1.2 m Also compare the results with and without outriggers and comment on the result obtained.	10	CO4
4	The plan of the structure as shown in the Fig.Q4, is of a 40 story 120 m 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 to determine deflections and forces in core and frame for a wind loading of 1.5 kN/m <sup>2</sup> by considering the wall frame interaction forces, the structural data given are as below: All columns have $I_{xx}=0.11 \text{ m}^4$ and beams have $I_{xx}=0.05\text{m}^4$ . The moment of inertia of the core is 400 m <sup>4</sup> , assume $E=2 \times 10^7 \text{ kN/m}^2$ .	10	CO4
5A	Write advantages and disadvantages of portal and cantilever method of analysis of rigid frame subjected to lateral loads.	03	CO3
5B	For a 8 storey building if there are two columns separated by a distance 5m c/c and connected with beam of size 250mm x 600mm, calculate the consequence of differential shortening of columns at the roof level. The column sizes are 250 x 300 and 250 x 600. The grade of concrete is M30 and floor to floor height is 3.5m. The load from each floor on the columns are 300kN. Comment on the results.	07	CO5

6/11/20

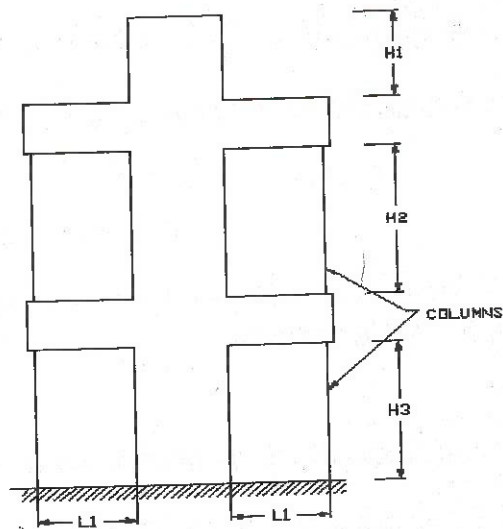


Fig. Q3

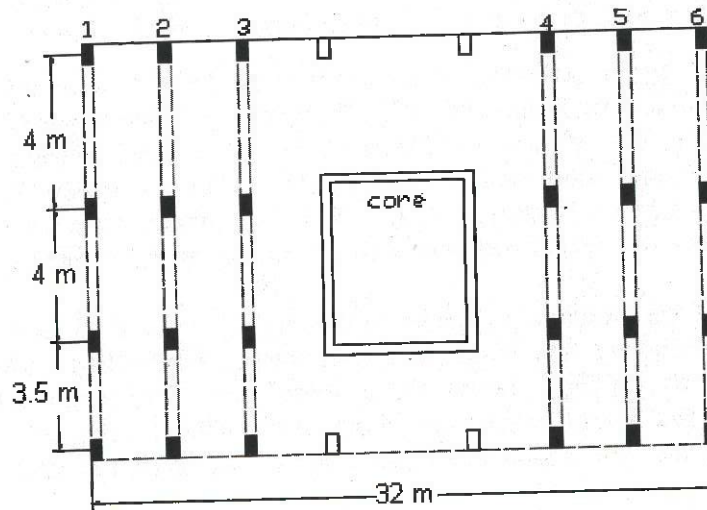


Fig Q4