

MANIPAL INSTITUTE OF TECHNOLOGY

A Constituent Institution of Manipal University

# I SEMESTER M.TECH. (STRUCTURAL ENGINEERING) END SEMESTER EXAMINATIONS, NOV/DEC 2017

# SUBJECT: ANALYSIS AND DESIGN OF TALL STRUCTURES [CIE-5154]

### **REVISED CREDIT SYSTEM**

### Time: 3 Hours

#### MAX. MARKS: 50

### **Instructions to Candidates:**

- ✤ Answer ALL the questions.
- ✤ Missing data may be suitable assumed.
- ✤ Use IS 456 2000 and IS-13290 are permitted

1 <b>A</b> .	Discuss briefly regarding design criteria of tall buildings related to (a) Sequential loading (b) Stiffness and drift limitation (c) Human comfort	06
1B.	Write briefly with neat sketch the behavior of Wall-frame interaction to lateral loads.	04
2.	A 6 story double diagonally braced frame as shown in Fig .Q2 Its required to determine the drift at all floor levels for a uniform lateral load of 25 kN/story. Assume the elastic modulus as $2x10^5$ N/mm <sup>2</sup> . The frame has span L = 3.5m and each story height of 4.0 m. The area of the diagonal bracings, columns and beams are 2000mm2, 3000 mm2 and 2400mm2 respectively.	10
3.	Determine the deflection due to lateral load for a multi-storied building given the following details; building has 52 storeys, each has 3.0 m height, each frame has 3 bays each of 10m span. All the beams has size of 500 mm x 1000mm and all the columns have size of 900mm x 1000mm . Wind pressure at the site may be assumed as $1.25 \text{ kN/m}^2$ . There are 4 Frames spaced at 8 m c/c, and 2 shear walls each 300 mm wide and 12000 mm in length. Calculate also the load shared by frame and shear wall by approximate method without considering the frame shear wall interaction forces. The materials are M <sub>60</sub> grade concrete.	10
4.	A chimney foundation has to be designed as full raft for chimney external diameter of 6.0m. Total axial load is 7000 kN at the base and total moment at base is 6500 kN-m. Safe bearing capacity of soil is 250 kN/m2, use M25 grade concrete and Fe415 grade steel. Sketch the reinforcement details.	10
5.	The plan of the structure is as shown in the Fig.Q6, is of a 42 story 147 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 at top and forces in frame and core for a wind loading of $1.5 \text{ kN/m}^2$ , consider the wall frame interaction forces, given are the structural data as below: All columns have $I_{xx}=0.10 \text{ m}^4$ and beams have $I_{xx}=0.015 \text{ m}^4$ . The moment of inertia of the core is $300 \text{ m}^4$ , assume $E=2x10^8 \text{ kN/m}^2$ . L1=L2=L3=7m and B=60m.	10

