

GUJARAT TECHNOLOGICAL UNIVERSITY
ME – SEMESTER III (NEW)– EXAMINATION – SUMMER 2017

Subject code: 2732005**Date:02/05/2017****Subject Name: Design of Tall Structures****Time: 02:30 pm to 05:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions
2. Use of IS 875, IS 800, IS 456, IS 1893, IS 13920, SP 16, IS 3370 are permitted
3. Use M20 grade of concrete and Fe 415 steel if not given any where
4. Draw neat sketch if required
5. Consider unit weight of concrete 25 kN/m^3 and Masonry 20 kN/m^3 if required.

Q.1	(a)	Enlist various lateral loads resisting structural system used in reinforced concrete high-rise structure along with its suitability for different height. Also describe in brief about shear lag effects in tube structures.	07
	(b)	Discuss the various structural control and energy dissipation devices used for tall building.	07
Q.2	(a)	Discuss various tube structural systems used in tall buildings along with their recent application.	07
	(b)	A reinforced concrete chimney 50 m high above ground has an outside diameter of 4 m. The thickness of the shell is 20 cm throughout. Vertical steel is taken as 1 % of the cross sectional area throughout. The total wind load above the base may be taken as 200 kN. Find the stresses developed due to wind and dead load at the base of chimney. Assume modular ratio =13.	07
		OR	
	(b)	Mention the name of four tall buildings in world along with type of structural system used. Discuss the various factor responsible for slimming down the weight of structural frame.	07
Q.3		Analyze for membrane forces at the base section of hyperbolic cooling tower and design suitable thickness and reinforcement for bottom section using following data. Height of hyperbolic cooling tower = 100 m Top diameter = 50 m Throat diameter = 46 m Density of concrete = 25 kN/m^3 distance of throat section from top = 25 m Use M20 grade of concrete and Fe 415 steel	14
		OR	
Q.3	(a)	Explain the behavior of coupled shear wall under lateral loading. What are various methods for analysis of coupled shear wall building?	07
	(b)	Explain various types of loads acting on the transmission line towers. Under What circumstances torsional load occur on them?	07
Q.4		Design a chimney having a height of 70 m using following data. Also check the stresses at base in reinforcements a) External diameter at top = 4.0 m b) External diameter at base = 5.0 m c) Shell thickness at top = 250 mm d) Shell thickness at base = 500 mm e) Wind Intensity = 2.0 kN/m^2 throughout	14

		f) Thickness of fire brick lining = 100 mm g) Air gap=100 mm h) Temperature difference = 75 °C i) Coefficient of thermal expansion = $10 \times 10^{-6} / ^\circ\text{C}$ j) $E_s = 2 \times 10^5 \text{N/mm}^2$ k) Density of brick lining = 20 kN/m ³ Use M30 grade of concrete and Fe 415 grade steel.	
		OR	
Q.4	(a)	List the various factors governing the height and configuration of transmission line tower. Also sketch the various types of bracing system used for transmission line tower.	07
	(b)	Describe the various performance levels of structural components. Define following terminology in reference to pushover analysis. (1) Demand (2) performance point (3) capacity.	07
Q.5		A microwave tower of height 70 m is to be built at out-skirt of Ahmadabad on a level ground. It has to carry one circular disc of 3.0 m diameter on top. Other data is as follows. a) Width of top of tower = 4 m b) Weight of platform on top = 1.0 kN/m ² c) Weight of antenna and fixture = 10 kN d) Weight of railing on top = 0.5 kN/m e) Weight of ladder and cage = 0.5 kN/m f) Self-weight of truss = 5 kN/m g) Live load = 1 kN/m ² h) Weight of miscellaneous items = 3.0 kN. Configure the tower and calculate the design loads in each panel. Give design details of the top panel only.	14
		OR	
Q.5	(a)	Explain in brief core and out-trigger system used in high-rise building mentioning its advantages.	07
	(b)	Explain in brief various types of floor system used for reinforced concrete building.	07
