Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E. SEMESTER III–EXAMINATION – WINTER 2015

Subject code: 2732005 **Date: 04/12/2015**

Subject Name: Design of Tall Structures

Time: 2:30 PM to 5:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Following IS codes and special publications are allowed**

i) IS800ii) IS875 iii) IS1893iv) SP 16 v) IS456vi) Steel table

Q.1 Design a chimney of height 100 m and check the stresses at base in bars. Data given: (14)

a) External diameter at top = 1.7 m
b) External diameter at base = 6.0 m
c) Shell thickness at top = 200 mm
d) Shell thickness at base = 500 mm
e) Wind Intensity=1.8 kN/m^2 throughout
f) Thickness of fire brick lining = 100 mm
g) Air Gap=100 mm
h) Temperature difference = 70 °C
i) Coefficient of thermal expansion = 11 x 10^{-6} / °C
j) E_s=210 x 10^{3}N/mm^2
k) Density of brick lining = 20 kN/m^3
l) M35 grade of concrete and Fe 415 grade steel.

Q.2(a) Derive the value of stresses generated in steel and concrete due to temperature in a RCC Chimney. (07)

(b) What are factors affecting design of tall structures? (07)

OR

(b) What are the checks to be carried out for stability analysis of foundation of a chimney? Explain any one in detail. (07)

Q.3

(a) Explain in brief various tube structural systems used in Tall buildings along with their recent application. (07)

(b) Describe various performance levels of structural components.Write the steps for obtaining the performance point using pushover analysis. (07)

OR

Q.3

(a) Explain in brief various floor systems in RCC tall buildings. (07)

(b) Explain in brief the outrigger system along with their recent application. (07)

Q.4

(a) Classify transmission line towers according to use. (07)

(b) How the total height of a transmission line tower is is calculated? Explain in brief the factors governing the height of transmission line tower. (07)

OR

Q.4 A hyperbolic cooling tower of 60 m height has following data (14)

Top diameter = 40 m

Throat diameter = 35 m

Density of concrete = 25 kN/m^3

Z_{top} = 15 m

Analyze for membrane forces at the base section of tower and design suitable thickness and reinforcement for bottom of the section.

Q.5

(a) List types of energy dissipation devices for tall buildings. Explain any one in detail. (07)

(b) Explain shear wall frame interactions. (07)

OR

Q.5 A microwave tower of height 60 m is to be built near Vadodara (basic wind speed 44 m/sec) on a level ground. It has to carry 1 circular disc of 3.0 m diameter on top. Other data is as follows. (14)

a) Width of top of tower = 3.5 m

b) Weight of platform on top = 1.0 kN/m^2

c) Weight of antenna and fixture = 9 kN

d) Weight of railing on top = 0.5 kN/m

e) Weight of ladder and cage = 0.6 kN/m

f) Self-weight of truss = 5 kN/m

g) Live load = 0.75 kN/m^2

h) Weight of miscellaneous items = 2.5 kN.

i) Terrain category III and Class of structure is B

Configure the tower and calculate the design loads in each panel. Give design details of the top panel only.