Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME – SEMESTER III (NEW) – • EXAMINATION – SUMMER 2016

Subject Code: 2732005 **Date:03/05/2016**

Subject Name: Design of Tall Structures

Time:10:30 am to 01:00 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)** What do you mean by tall buildings? Mention the name of four tall buildings in world along with type of structural system used. Discuss the factor responsible for slimming down the weight of structural frame. **07**

(b) Discuss various tube structural systems used in tall buildings along with their recent application. **07**

Q.2 **(a)** Explain in brief various types of floor system used for steel-concrete composite building. **07**

(b) Enlist various lateral load resisting structural system used in high-rise structure constructed using steel along with its suitability for different height **07**

OR

(b) Discuss the various structural control and energy dissipation devices used for tall building. **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. **14**

Height of hyperbolic cooling tower = 55 m
Top diameter = 40 m
Throat diameter = 35 m
Density of concrete = 25 kN/m^3
Z_{top} = 15 m

OR

Q.3 **(a)** Explain in brief shear wall frame interaction system **07**

(b) Explain various types of loads acting on the transmission line towers. Under What circumstances torsional load occur on them? **07**

Q.4 A microwave tower of height 50 m is to be built at out-skirt of Ahmadabad on a level ground. It has to carry one circular disc of 2.5 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 = 10 kN
d) Weight of railing on top = 0.45 kN/m
e) Weight of ladder and cage = 0.5 kN/m
f) Self-weight of truss = 5 kN/m
g) Live load = 0.75 kN/m^2
h) Weight of miscellaneous items = 3.0 kN.
i) Terrain category = 2

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

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) Explain in brief core and out trigger system used in high-rise building mentioning its advantages. **07**

Q.5 Design a chimney having a height of 80 m using following data. Also check the stresses at base in bars **14**

a) External diameter at top = 3.0 m
b) External diameter at base = 5.0 m
c) Shell thickness at top = 200 mm
d) Shell thickness at base = 500 mm
e) Wind Intensity = 2.0 kN/m^2 throughout
f) Thickness of fire brick lining = 100 mm
g) Air gap=100 mm
h) Temperature difference = 50 °C
i) Coefficient of thermal expansion = 10×10^{-6} / °C
j) $E_s = 2.1 \times 10^5 N/mm^2$
k) Density of brick lining = 20 kN/m^3

M30 grade of concrete and Fe 415 grade steel.

OR

Q.5 **(a)** Write the steps to find the performance point using Push over analysis **07**

(b) Discuss the various checks to be carried out for stability analysis of foundation of a chimney. **07**

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