GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VI(NEW) EXAMINATION – WINTER 2022

Subject Code:3160612   **Date:16-12-2022**
Subject Name:Design of Reinforced Concrete structures
Time:02:30 PM TO 05:00 PM   **Total Marks:70**
Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**
5. **IS:456(2000), IS-1893-1(2016), IS-13920(2016), IS-3370 (Part 1 to 4), SP-16, SP-34, IS-875 (Part 1 to 5) are permitted.**
6. **Use M20 grade of concrete and Fe415 grade of steel, if not given.**

Q.1	**(a)**	Draw neat sketch of behaviour of various components of the cantilever retaining wall.	**03**
	(b)	Write guidelines for preparation of structural layout for building.	**04**
	(c)	A G+6 storey commercial building of 29 m height is having 4 bays of 4m in both x & y directions. The floor height is 4 m. Parapet height is 1 m. The building is located at Surat. The upwind slope is less than 3º. Estimate the Wind loads at nodal points of internal frame. Assume depth of foundation is 3 m and depth of beam is 500 mm. Top of the ground beam is at ground level and depth of ground beam is 500 mm.	**07**
Q.2	**(a)**	Explain ductile detailing criteria for spacing of links over the entire length of the beam.	**03**
	(b)	A cantilever retaining wall has to retain level backfill of height 3.5m above ground level. Unit weight of soil = 18kN/m^3, Angle of repose of soil = 28º, SBC of soil = 180kN/m^2 and coefficient of friction = 0.55. Fix basic dimensions of the cantilever retaining.	**04**
	(c)	Using data of Q.2(b), determine factor of safety against overturning and sliding of the cantilever retaining wall. Also, determine minimum & maximum pressure at the base of the cantilever retaining wall.	**07**
		OR	
	(c)	Explain different types of vertical irregularities in the buildings.	**07**
Q.3	**(a)**	Draw neat sketches of behaviour of cylindrical tank for the following cases: (i) wall with fixed base and free top, subjected to triangular load (ii) wall with hinged base and free top, subjected to triangular load.	**03**
	(b)	Prepare structural layout for the RC frame G+3 storey commercial building having 5 bays of 5 m each in x-direction and 3 bays of 3 m each in y-direction. Floor height is 3.5m. Designate slabs, beams and columns. Suggest preliminary dimensions of the slab, beam and columns.	**04**
	(c)	Using data of Q.3(b), estimate load on intermediate continuous beam laying in y-direction. Assume wall thickness = 230mm.	**07**
		OR	
Q.3	**(a)**	Explain different types of retaining wall.	**03**
	(b)	A counterfort retaining wall has to retain level backfill of height 6m above the ground level. Unit weight of soil = 18kN/m^3, Angle of repose of soil = 28º and SBC of soil = 180kN/m^2. Fix the basic dimensions of the various elements of counterfort retaining wall.	**04**
	(c)	Using data of Q.3(b) OR, design the stem of counterfort retaining wall.	**07**

Q.4 (a) Draw Intze tank and show various structural elements of the Intze tank. **03**

(b) A circular underground water tank of 10 m diameter and depth 3 m is hinged **04**
at base and free at top. Using IS 3370 (Part-4), determine tension coefficients
and moment coefficients for the design of tank wall. Use M30 grade of
concrete and Fe415 steel. Take unit weight of dry soil 18kN/m^3 and $\Phi=30°$.

(c) Using data of Q.4(b), design the cylindrical wall of the water tank for (i) the **07**
tank is full of water and no soil outside, (ii) the tank is empty and surrounding
soil is dry.

OR

Q.4 (a) Which are the assumptions made to analyse the flat slab by Equivalent Frame **03**
Method.

(b) Determine depth of the flat slab and check flat slab interior panel of size 5m **04**
$\times$ 5m for the 'effects of pattern loading'. Columns are of size 400mm $\times$
400mm. The storey height above and below slab is 3m. Live load on panel is
3kN/m^2. Floor finish load is 1kN/m^2.

(c) Using data of Q.4(b) OR, design flat slab interior panel. Also, check flat slab **07**
for shear.

Q.5 (a) Explain philosophy of the earthquake resistant design of the structures. **03**

(b) Explain about torsionally coupled and torsionally uncoupled system. **04**

(c) A four storey building of 25m $\times$ 25m plan dimensions and 3m floor height is **07**
is located in seismic zone III on a site with medium soil. The structure type is
special moment resisting frame. Seismic weight of first floor, second floor and
third floor; $W_1 = W_2 = W_3 = 5000$kN. Seismic weight of roof slab, $W_4 =$
3500kN. Calculate design base shear and storey shear using seismic
coefficient method.

OR

Q.5 (a) Which are the conditions to be fulfilled for the design of flat slab by Direct **03**
Design Method?

(b) Fix the basic dimensions of Intze type container of an elevated water tank to **04**
store 5 lacs liter of water. Height of staging =15 m up to bottom of tank. Use
M30 grade concrete and Fe 415 grade steel.

(c) Using data of Q.5(b) OR, design top spherical dome and top ring beam. **07**

****