GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VI (NEW) EXAMINATION – WINTER 2023

Subject Code:3160612   **Date:11-12-2023**

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, IS 3370, IS 875, SP 16, IS 1893, IS 1343, IS 13920 are permitted.
6. Use M20 grade of concrete and Fe415 grade of steel, until otherwise stated.

			MARKS
Q.1	**(a)**	Write guidelines for preparation of structural layout for building	**03**
	(b)	Explain ductile detailing criteria for spacing of links over the entire length of the beam.	**04**
	(c)	A cantilever retaining wall has to retain level backfill of height 3.4m above ground level. Unit weight of soil = 17kN/m^3 , Angle of repose of soil = 29° , SBC of soil = 170kN/m^2 and coefficient of friction = 0.56. Fix basic dimensions of the cantilever retaining.	**07**
Q.2	**(a)**	Enlist different types of vertical irregularities in the buildings and explain any one of them.	**03**
	(b)	Explain different types of retaining wall.	**04**
	(c)	Perform the stability checks of the cantilever retaining wall of Q. 1(c).	**07**
		OR	
	(c)	Design a stem of the cantilever retaining wall of Q.1 (c).	**07**
Q.3	**(a)**	Determine depth of the flat slab and check flat slab interior panel of size 6m × 6m for the 'effects of pattern loading'. Columns are of size 400mm × 400mm. The storey height above and below slab is 3.2m. Live load on panel is 3kN/m^2. Floor finish load is 1kN/m^2.	**07**
	(b)	Using data of Q.3(a), design flat slab interior panel. Also, check flat slab for shear.	**07**
		OR	
Q.3	**(a)**	Which are the conditions to be fulfilled for the design of flat slab by Direct Design Method?	**03**
	(b)	Explain ductile detailing criteria for spacing of links over the entire length of the column.	**04**
	(c)	State and explain the assumptions made to analyze the flat slab by Equivalent Frame Method.	**07**
Q.4	**(a)**	Explain about torsionally coupled and torsionally uncoupled system	**04**
	(b)	Calculate design base shear and storey shear using seismic coefficient method. A four storey building of 20m × 25m plan dimensions and 3m floor height is is located in seismic zone IV on a site with medium soil. The structure type is special moment resisting frame. Seismic weight are of first floor, second floor and third floor; W1 = W2 = W3 = 4200kN. Seismic weight of roof slab, W4 = 3400kN.	**10**

Q.4 **(a)** Explain philosophy of the earthquake resistant design of the structures. **04**

(b) A G+7 residential building of 24 m height is having a plan dimension 20 m x 20 m, having bay width 4 m in both directions. The floor height is 3.2 m. Parapet height is 1 m. The building is located at Surat. The upwind slope is less than 3°. Estimate the Wind loads acting on internal frame at nodal points. Assume the depth of foundation is 1.5 m, depth of beam is 500 mm and ground beam is located at 500 mm below ground level. **10**

Q.5 **(a)** Draw Intze tank and show various structural elements of the Intze tank. **04**

(b) A circular underground water tank of 12 m diameter and depth 3.2 m is hinged 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 17kN/m^3 and Φ=30°. Also, design the cylindrical wall of the water tank for the tank is full of water and no soil outside. **10**

OR

Q.5 **(a)** Classify different jointing material used in the water tank. Explain any one in detail. **03**

(b) Explain four virtues of Earthquake Resistant Design. **04**

(c) Prepare structural layout for the RC frame G+3 storey commercial building having 4 bays of 4 m each in x-direction and 3 bays of 3 m each in y-direction. Floor height is 3.8m. Designate slabs, beams and columns. Suggest preliminary dimensions of the slab, beam and columns. **07**

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