Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VI EXAMINATION – WINTER 2025

Subject Code: 3160612 Date:29-11-2025

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) is permitted.**
6. **Use M20 grade of concrete and Fe415 grade of steel, until otherwise stated.**

			MARKS
Q.1*	**(a)**	Explain effect of Irregularities on performance of RC buildings during earthquakes.	**03**
	(b)	Explain various Joints used in water tank with sketch.	**04**
	(C)	A G+6 multistoried braced frame building of 30 m height is having a plan dimension 20 m X 30 m, having bay width 5 m in both directions. Take Ground floor height as 5 m and all other floor height is 4 m. Take parapet height 1m. The location of building is in Chennai city with the terrain category III. The upwind slope is less than 3°. Assume overall depth of all beams = 500 mm and slab thickness 150 mm. Consider Design life of building as 100 years. Compute wind loads acting on an internal frame at node points and plot wind pressure diagram as per provisions of IS: 875(Part-III)	**07**
Q.2	**(a)**	Prepare structural layout and nominate all the members like slabs, beams, columns of G+3 building (whole structure) of having 4 bays of 5 m in X -direction and 4 bays of 4 m in Y direction.	**03**
	(b)	For Q.2 (a) Calculate the load on any intermediate continuous beam of typical floor. Consider slab thickness is 120 mm. Internal and external wall thickness is 230 mm.	**04**
	(c)	For Q.2 (b) deign the continuous beam and give the reinforcement detail of longitudinal section.	**07**
		OR	
	(c)	Enlist different types of slab form in of above layout Q.2 (a) and Design any one slab panel with reinforcement details.	**07**
Q.3	**(a)**	The cantilever retaining wall has to retain the earth with a horizontal top 5.5 m above ground level. Density of earth is $20kN/m^3$. Angle of internal friction ϕ is 30 degree. SBC of soil is 120kN/m. Coefficient of friction μ is 0.5. Determine dimensions of the retaining wall. Use M25 and Fe 415.	**03**
	(b)	For problem 3(a) above, check the stability of wall.	**04**
	(c)	For problem 3(a) above, design Toe Slab and draw sketch of reinforcement details. Use M25 and Fe 415.	**07**

OR

Q.3	**(a)**	Explain the criteria for stability of the structure against overturning and sliding as per IS 456-2000.	**03**
	(b)	Explain the check for one way shear and two way shear for flat slab with codal provisions.	**04**
	(c)	The Counterfort retaining wall has to retain the earth with a horizontal top 6.5 m above ground level. Density of earth is $20kN/m^3$. Angle of internal friction ϕ is 30 degree. SBC of soil is$120kN/m^2$. Coefficient of friction μ is 0.6. Determine dimensions of the retaining wall and check the stability of wall. Draw neat sketch.	**07**
Q.4	**(a)**	Elaborate the limitations of direct design method used for flat slab.	**03**
	(b)	Explain proportioning of Flat slab components as per IS: 456-2000.	**04**
	(c)	Design an interior panel of flat slab having equal panels of 4 m × 4 m. The internal columns are 500 mm in diameter and column head is 1000 mm in diameter. The story height above and below slab is 4m. Design the flat slab with drop and column head. Live load 4 kN/m^2. Use M-25 concrete and Fe-415 steel.	**07**

OR

Q.4	**(a)**	Enlist the minimum reinforcement criteria for the structures retaining liquid in context to IS 3370.	**03**
	(b)	The circular water tank of 500 kl capacity is required to construct below ground level. Considering flexible base, determine dimensions of the tank. The free board is 0.2 m. The unit weight of soil is $20kN/m^3$ and angle of internal friction is 30^0. Use M25 and Fe 415.	**04**
	(c)	For Q. 4(b) above, design components of circular water tank and draw detailed plan and section of water tank showing all the dimensions and reinforcements.	**07**
Q.5	**(a)**	Explain ductile detailing of Column as per IS: 13920-2016.	**03**
	(b)	Explain requirements of shear wall as per IS: 13920-2016.	**04**
	(c)	Classify the methods of improving ductility in a structure.	**07**

OR

Q.5	**(a)**	Explain Capacity Design Concept	**03**
	(b)	Explain Philosophy of Earthquake resistant design. Give four virtue of good earthquake resistant design.	**04**
	(c)	Draw and detail the typical Qualitative reinforcement detailing of two span reinforced concrete continuous rectangular beam od 230mm X 450 mm as per IS13920-2016.	**07**

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