GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER– VIII EXAMINATION – SUMMER 2020

Subject Code: 2170607   **Date:26/10/2020**
Subject Name: DESIGN OF REINFORCED CONCRETE STRUCTURES
Time: 10:30 AM TO 01:30 PM   **Total Marks: 70**
Instructions:
1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Draw neat and clean figures whenever required.
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, if not given.

MARKS

Q.1(a)	Explain Philosophy of Earthquake resistant design.	**03**
(b)	G+3 residential frame building (whole structure) of having 5 bays of 5 m in X–direction and 6 bays of 4 m in Y-direction. Prepare and draw structural layout and designate all structural members like columns, beams and slabs etc.	**04**
(c)	A G+7 multistoried braced frame building of 30 m height is having a plan dimension 20m X 30m, having bay width 5 m in both direction. 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 "Vadodara" city of Gujarat state with the terrain category III. The upwind slope is less than 3^0, Take plinth is at 1m above G.L having no plinth beams but consider beams at 1m below G.L and footings are provided at 2 m below G.L. 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)	For the RC frame structural layout as prepared above in problem Q.1(b), Calculate the axial loads and bending moments on any one intermediate column. Mention clearly designation of selected column.	**03**
(b)	Design the same Intermediate column for the forces obtained in problem Q. 2(a) above and show the reinforcement detail with sketch.	**04**
(c)	Design any one slab panel of above problem Q. 1 (b) having one long edge discontinuous show the reinforcement detail with sketch.	**07**
	OR	
(c)	Estimate the load on the any one continuous beam at typical floor level of above problem Q.1 (b) and design it.	
Q.3(a)	The cantilever retaining wall has to retain the earth with a horizontal top 4 m above ground level. Density of earth is 17 kN/m^3. Angle of internal friction ϕ is 30 degree. SBC of soil is 150 kN/m^2. Coefficient of friction μ is 0.55. Determine dimensions of the retaining wall. Use M20 grade of concrete and Fe 415 grade of steel.	**03**
(b)	For problem 3 (a) above, check the stability of wall.	**04**
(c)	For problem 3 (a) above, design Toe and draw diagram showing reinforcement details.	**07**
	OR	
Q.3(a)	The counter fort retaining wall has to retain the earth with a horizontal top 6 m above ground level. Density of earth is 16.2 kN/m^3. Angle of internal friction ϕ is 30 degree. SBC of soil is 150 kN/m^2. Coefficient of friction μ is 0.6. Determine dimensions of the retaining wall. Use M20 grade of concrete and Fe 415 grade of steel.	**03**
(b)	For problem 3 (a) above, check the stability of wall.	**04**
(c)	For problem 3 (a) above, design stem and draw diagram showing reinforcement details.	**07**
Q.4(a)	Explain ductile detailing of column as per IS: 13920 with sketch.	**03**

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(b) Explain the 'Strong column-Weak beam' design concept. **04**

(c) Design an interior panel of a flat slab of panel size 5m x 5m without providing drop and column head. Size of columns = 300mm x 400 mm, Live load = 4 kN/m^2, Floor finish = 1 kN/m^2, Height of column 4m above and below slab. Use M20 concrete and Fe 415 steel. **07**

OR

Q.4(a) Give various methods of improving ductility of structures. **03**

(b) Explain ductile detailing of Beam as per IS: 13920 with sketch. **04**

(c) Design an interior panel of flat slab having equal panels of 6 m × 6 m. The internal columns are 500mm in diameter and column head is 1000 mm in diameter. The Storey height above and below slab is 4 m. Design the flat slab with drop and column head. Live load 4 KN/m^2. Use M20 grade of concrete and Fe 415 grade of steel. **07**

Q.5(a) Explain various Joints used in water tank with sketch. **03**

(b) Fix the basic dimensions of circular overhead water tank container with flat bottom for a capacity of 5 lakh liters.. Use M25 grade concrete and Fe 415 steel. **04**

(c) For problem Q-5 (b) above, Design and detail top spherical dome and top ring beam of the container. **07**

OR

Q.5(a) Fix the basic dimensions of intze tank container of an elevated water tank to store 5 lakh litres water. Height of the staging is 16 m up to the bottom of the tank. Wind load = 1.5 KN/m^2 throughout the height. Use M30 & Fe415. **03**

(b) For problem Q-5 (a) above, Design and detail Top ring beam of the container. **04**

(c) For problem Q-5 (a) above, Design and detail cylindrical wall of the container. **07**

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