

GUJARAT TECHNOLOGICAL UNIVERSITY

BE-6 SEMESTER – OLD PAPER – S22 TO W25 – QUESTION BANK

Subject Name & Code:

DESIGN OF REINFORCED CONCRETE STRUCTURES (3160612)

Unit 1: Building Layout and Design

Repeated Questions:

1. Prepare structural layout and nominate all the members like slabs, beams, columns of a G+3 building. (Appears in 7 papers)
 - (S25 - Q.1b, 03 marks)
 - (S24 - Q.1b, 04 marks)
 - (S23 - Q.2a, 03 marks)
 - (W24 - Q.5 OR a, 07 marks)
 - (W23 - Q.5 OR c, 07 marks)
 - (S22 - Q.2b, 04 marks)
 - (W22 - Q.2a, 03 marks)
2. For a given structural layout, calculate the load on an intermediate/continuous beam. (Appears in 3 papers)
 - (W25 - Q.2b, 04 marks)
 - (S23 - Q.2b, 04 marks)
 - (W22 - Q.2b, 04 marks)
3. Write guidelines for preparation of structural layout for building. (Appears in 3 papers)
 - (W23 - Q.1a, 03 marks)
 - (S22 - Q.2a, 03 marks)
 - (W22 - Q.1b, 03 marks)
4. Compute wind loads acting on an internal frame at node points and plot wind pressure diagram for a given multistorey building. (Appears in 3 papers)
 - (W25 - Q.1c, 07 marks)
 - (S22 - Q.1c, 07 marks)
 - (S24 - Q.1c, 07 marks) [Diagram given - refer Question paper of S24]
5. A multistoried unbraced building as shown in Fig. 1 having 20m X 30m plan dimension... Determine the designed wind pressure acting on the internal frame and draw the pressure diagram. (Appears in 3 papers)
 - (S25 - Q.1c, 07 marks) [Diagram given - refer Question paper of S25]
 - (W24 - Q.1c, 07 marks) [Diagram given - refer Question paper of W24]
 - (S23 - Q.1c, 07 marks)

Other Important Questions:

1. Enlist different types of slab forms in a given layout and design any one slab panel with reinforcement details. (W25 - Q.2 OR c, 07 marks)
2. For a given layout, design the continuous beam and give the reinforcement detail of longitudinal section. (W25 - Q.2c, 07 marks) / (S23 - Q.2c, 07 marks) / (W22 - Q.2c, 07 marks)
3. Estimate the load on the continuous beam of a given span and design it. (S22 - Q.2 OR c, 07 marks)
4. Design the ground floor column for the G+3 building. (S23 - Q.2 OR c, 07 marks)
5. Determine the fundamental natural period of a four-storeyed MRF building, with and without masonry infill. (S25 - Q.2a, 07 marks) / (W24 - Q.4 OR b, 04 marks) / (S24 - Q.4 OR b, 04 marks)

6. Explain ductile detailing criteria for spacing of links over the entire length of the beam. (W23 - Q.1b, 04 marks) / (S25 - Q.3b, 04 marks) / (W24 - Q.3a, 04 marks) / (S24 - Q.3b, 04 marks)
 7. Estimate wind loads at nodal points of internal frame for a given G+6 building. (W22 - Q.1c, 07 marks)
 8. For a given RC frame G+3 building layout, estimate load on intermediate continuous beam. (W22 - Q.3 OR c, 07 marks)
 9. Prepare structural layout for a given RC frame G+3 building and suggest preliminary dimensions. (W22 - Q.3b, 07 marks)
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Unit 2: Design of Retaining Wall

Repeated Questions:

1. For a cantilever retaining wall with given soil properties (height, unit weight, angle, SBC, μ), determine dimensions and check stability. (Appears in 5 papers)
 - (W25 - Q.3a & b, 03+04 marks)
 - (S22 - Q.3a & b, 03+04 marks)
 - (S23 - Q.3a & b, 03+04 marks)
 - (W24 - Q.2c, 07 marks)
 - (S24 - Q.2a, b & c, 03+04+07 marks)
2. Fix the basic dimensions of a cantilever retaining wall for given soil data. (Appears in 3 papers)
 - (W23 - Q.1c, 07 marks)
 - (W22 - Q.2b, 07 marks)
 - (S22 - Q.4 OR a & b, 07 marks)
3. Explain different types of retaining walls. (Appears in 3 papers)
 - (W25 - Q.3 OR a, 03 marks)
 - (W23 - Q.2b, 04 marks)
 - (W22 - Q.3 OR a, 03 marks)
4. The counterfort retaining wall has to retain earth... Determine dimensions and check stability. Draw neat sketch. (Appears in 3 papers)
 - (W25 - Q.3 OR a, 07 marks)
 - (S23 - Q.1c, 07 marks)
 - (S22 - Q.3 OR a & b, 03+04 marks)

Other Important Questions:

1. Draw neat sketch of behaviour of various components of the cantilever retaining wall. (W22 - Q.1a, 03 marks)
 2. For a cantilever wall, determine factor of safety against overturning & sliding and min/max base pressure. (W22 - Q.2c, 07 marks)
 3. Design the stem/toe slab of the cantilever retaining wall and draw reinforcement details. (W25 - Q.3c, 07 marks) / (S22 - Q.3c, 07 marks) / (W23 - Q.2 OR c, 07 marks)
 4. Explain the criteria for stability of the structure against overturning and sliding as per IS 456. (W25 - Q.3 OR a, 03 marks)
 5. Fix basic dimensions of various elements of a counterfort retaining wall. (W22 - Q.3 OR b, 07 marks)
 6. Design the stem of a counterfort retaining wall. (W22 - Q.3 OR c, 07 marks)
 7. A counterfort retaining wall with given dimensions and soil properties... Estimate the horizontal and vertical loads and moments. (S25 - Q.4c, 07 marks) / (W24 - Q.3 OR c, 07 marks) / (S24 - Q.3c, 07 marks)
 8. Enlist and explain various types of retaining walls based on their usage. (S23 - Q.1a, 03 marks)
 9. Design Heel Slab and draw sketch of reinforcement details for a cantilever wall. (S23 - Q.3 OR c, 07 marks)
 10. How will you provide drainage to a retaining wall? State the stability requirements. (S25 - Q.2b, 07 marks) / (S24 - Q.4 OR c, 07 marks)
 11. Discuss briefly various types of retaining walls with neat sketches and situations where a particular type is used. (S25 - Q.5a, 03 marks)
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Unit 3: Design of Water Tank

Repeated Questions:

1. Explain various joints used in water tank with sketch. / Explain the various types of joints that can be used in water tanks. (Appears in 4 papers)
 - (W25 - Q.1b, 04 marks)
 - (S22 - Q.4a, 03 marks)
 - (W24 - Q.5a, 03 marks)
 - (S24 - Q.4a, 03 marks)
2. Enlist the minimum reinforcement criteria for structures retaining liquid as per IS 3370. (Appears in 3 papers)
 - (W25 - Q.4 OR a, 03 marks)
 - (S23 - Q.1b, 03 marks)
 - (S24 - Q.5 OR b, 04 marks) / (W24 - Q.5 OR b, 04 marks)
3. Draw Intze tank and show/explain various structural elements. (Appears in 3 papers)
 - (W22 - Q.4a, 03 marks)
 - (W23 - Q.5a, 04 marks)
 - (S24 - Q.3a, 03 marks) / (S25 - Q.5 OR a, 03 marks)
4. For a circular underground water tank (given dia, depth, support condition), determine tension & moment coefficients using IS 3370 and/or design the wall. (Appears in 3 papers)
 - (W22 - Q.4b & c, 04+07 marks)
 - (W23 - Q.5b, 10 marks)
 - (S23 - Q.4 OR b & c, 04+07 marks)

Other Important Questions:

1. The circular water tank of XXX capacity is required to construct below ground level. Considering flexible base, determine dimensions of the tank. (W25 - Q.4b, 04 marks) / (S23 - Q.3 OR b, 04 marks)
2. Design components of a circular water tank and draw detailed plan and section. (W25 - Q.4c, 07 marks) / (S23 - Q.3 OR c, 07 marks)
3. Draw neat sketches of behaviour of cylindrical tank for: (i) wall fixed base free top (ii) wall hinged base free top under triangular load. (W22 - Q.3a, 03 marks) / (W24 - Q.2b, 04 marks)
4. Fix the basic dimensions of Intze type container for an elevated tank to store X litres of water. (W22 - Q.5 OR b, 07 marks) / (S22 - Q.4a, 03 marks)
5. Design top spherical dome and top ring beam for an Intze tank. (W22 - Q.5 OR c, 07 marks) / (S22 - Q.4b & c, 04+07 marks)
6. Classify different jointing material used in water tank. Explain any one in detail. (W23 - Q.5 OR a, 03 marks) / (S25 - Q.4b, 03 marks)
7. For a rectangular underground tank of given capacity, find design constants / calculate bending moments and direct compression on long & short wall. (S22 - Q.4b, 04 marks) / (S23 - Q.4 OR b, 04 marks)
8. Design Long wall and Short Wall of a rectangular tank with necessary checks and reinforcement sketches. (S23 - Q.4 OR c, 07 marks)
9. A slab of a water retaining structure is XXX mm thick... Determine max spacing of cracks and distribution of steel for moisture and temperature. (W24 - Q.5c, 07 marks) / (S24 - Q.5 OR c, 07 marks)
10. Explain the limit state method as applied to water retaining structures. (W24 - Q.4 OR c, 07 marks) / (S24 - Q.3 OR c, 07 marks)
11. A wall in a long reservoir is 90m long, 4m high and 350mm thick. Calculate steel area to control thermal cracking and joint spacing for different restraint conditions. (S25 - Q.5c, 07 marks)

Unit 4: Design of Flat Slab

Repeated Questions:

1. Explain the codal provision of Direct Design Method for Flat slab. (Appears in 6 papers)
 - (S22 - Q.5b, 04 marks)
 - (W24 - Q.1b, 04 marks)
 - (S23 - Q.4b, 04 marks)
 - (S24 - Q.3 OR b, 04 marks)
 - (W25 - Q.4 OR b, 04 marks)
 - (W23 - Q.3 OR b, 04 marks)
2. Enlist advantages and disadvantages of flat slab. (Appears in 3 papers)
 - (S22 - Q.5a, 03 marks)
 - (S23 - Q.4a, 03 marks)
 - (S24 - Q.3 OR a, 03 marks)
3. Which are the assumptions made to analyse the flat slab by Equivalent Frame Method? (Appears in 3 papers)
 - (W22 - Q.4 OR a, 03 marks)
 - (S25 - Q.4a, 03 marks)
 - (W24 - Q.3 OR a, 03 marks) / (S24 - Q.5 OR a, 03 marks)
4. Design an interior panel of flat slab with drop and column head for given data (panel size, column details, live load). (Appears in 2 papers)
 - (W25 - Q.4c, 07 marks)
 - (S22 - Q.5c, 07 marks)

Other Important Questions:

1. Elaborate the limitations of direct design method used for flat slab. (W25 - Q.4a, 03 marks)
 2. Explain proportioning of Flat slab components as per IS: 456-2000. (W25 - Q.4b, 04 marks)
 3. Explain the check for one way shear and two way shear for flat slab with codal provisions. (W25 - Q.3 OR b, 04 marks)
 4. Determine depth of flat slab and check interior panel for 'effects of pattern loading' for given data. (W22 - Q.4b, 04 marks) / (W23 - Q.3a, 07 marks)
 5. Using the data from the above, design the flat slab interior panel and check for shear. (W22 - Q.4 OR c, 07 marks) / (W23 - Q.3b, 07 marks)
 6. State and explain the assumptions made to analyze the flat slab by Equivalent Frame Method. (W23 - Q.3 OR c, 07 marks)
 7. Determine the main reinforcement for an interior panel of flat slab without drop and column head for given data. Draw sketch. (S23 - Q.4c, 07 marks)
 8. What are the flat slab and conventional slab-beam diaphragms? Explain with examples. (S25 - Q.5c, 07 marks) / (S24 - Q.4 OR c, 07 marks) / (S24 - Q.5c, 07 marks)
 9. Which are the conditions to be fulfilled for the design of flat slab by Direct Design Method? (W22 - Q.5 OR a, 03 marks) / (W23 - Q.3 OR a, 03 marks)
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Unit 5: Earthquake Resistant Design of Building

Repeated Questions:

1. Explain Philosophy of Earthquake resistant design. Give four virtues of good earthquake resistant design. (Appears in 5 papers)
 - (S22 - Q.1a, 03 marks)
 - (W22 - Q.5a, 03 marks)
 - (W23 - Q.5 OR b, 04 marks)
 - (S24 - Q.1a, 03 marks)
 - (W25 - Q.5 OR b, 04 marks)
2. Explain ductile detailing of Column as per IS: 13920-2016. (Appears in 4 papers)
 - (W25 - Q.5a, 03 marks)
 - (S22 - Q.5 OR a, 03 marks)
 - (S23 - Q.5 OR a, 03 marks)
 - (W24 - Q.5 OR c, 07 marks)
3. Explain effect of Irregularities on performance of RC buildings during earthquakes. / Explain different types of irregularities in buildings. (Appears in 3 papers)
 - (W25 - Q.1a, 03 marks)
 - (W22 - Q.2 OR c, 07 marks)
 - (S23 - Q.5b, 04 marks)
 - (W24 - Q.2 OR c, 07 marks)
4. Calculate design base shear and storey shear using seismic coefficient method for a given multi-storey building data. (Appears in 3 papers)
 - (W22 - Q.5c, 07 marks)
 - (W23 - Q.4b, 10 marks)
 - (S23 - Q.5c, 07 marks)
5. Explain about torsionally coupled and torsionally uncoupled system. (Appears in 2 papers)
 - (W22 - Q.5b, 04 marks)
 - (W23 - Q.4a, 04 marks)

Other Important Questions:

1. Explain Capacity Design Concept. (W25 - Q.5 OR a, 03 marks) / (W24 - Q.2a, 03 marks)
2. Classify the methods of improving ductility in a structure. (W25 - Q.5c, 07 marks)
3. Explain requirements of shear wall as per IS: 13920-2016. (W25 - Q.5b, 04 marks)
4. Draw and detail typical qualitative reinforcement detailing of a two-span reinforced concrete continuous rectangular beam as per IS 13920. (W25 - Q.5 OR c, 07 marks) / (S23 - Q.5c, 07 marks)
5. Mention the ductile detailing criteria for flexural members as per IS 13920. (S22 - Q.1b, 03 marks)
6. Explain ductile detailing criteria for spacing of links over the entire length of the column. (W23 - Q.3 OR b, 04 marks)
7. Give the guidelines for efficient earthquake resistant design of structures. (S23 - Q.5 OR b, 04 marks) / (S24 - Q.4 OR a, 03 marks)
8. Define: (1) Epicenter (2) Focus (3) Critical Damping. (S25 - Q.1a, 03 marks)
9. Discuss the expected damages by Earthquake in structures having (i) Soft storey (ii) Floating columns. (S25 - Q.3a, 03 marks)
10. Explain with sketch (i) Short column effect (ii) Strong column weak beam. (S23 - Q.5a, 03 marks)
11. Write a short note on (a) Structural Plan density (b) Plan aspect ratio of buildings. (S25 - Q.5b, 03 marks) / (W24 - Q.3b, 04 marks) / (S24 - Q.5b, 04 marks)
12. Write a brief note on Mechanism of load transfer in multistoreyed (G+3) buildings. (S24 - Q.5a, 03 marks) / (W24 - Q.5b, 04 marks)
13. What is the basic design philosophy of seismic design of structures? (W24 - Q.1a, 03 marks)

Unit 6: Design of Foundations

Repeated Questions:

1. An isolated footing for a column carrying an axial load... Determine the dimensions of the footing. (Appears in 3 papers)
 - (W24 - Q.4b, 04 marks)
 - (S24 - Q.4b, 04 marks)
 - (S25 - Q.3a, 07 marks)

Other Important Questions:

1. Design of isolated footing under axial load and uni-axial bending, combined footing. (From Syllabus Image)
2. For an isolated rectangular sloped footing for a given column and load, determine depth of footing in two orthogonal directions. (S24 - Q.4 OR c, 07 marks)
3. For an RCC column, calculate trial size of footing and net upward pressure. Evaluate steel requirement and development length. Check for shear, design base, and provide reinforcement detailing. (S25 - Q.3 OR a, b & c, 03+04+07 marks)
