

Code No: 135AJ

R16

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, May/June - 2019

DESIGN OF REINFORCED CONCRETE STRUCTURES

(Common to CE, CEE)

Time: 3 hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

(25 Marks)

- 1.a) What is the advantage of a T-beam design concept? [2]
- b) Explain the various limit states. [3]
- c) What is the significance of development length in RCC members? [2]
- d) What are the parameters influencing the design shear strength of concrete? [3]
- e) What are the advantages of helically reinforced columns? [2]
- f) Explain the modes of failure of RCC short and long columns. [3]
- g) What is the necessity of a combined footing? [2]
- h) Distinguish between one-way shear and two-way shear. [3]
- i) What is the need of limiting the deflection of various structural members? [2]
- j) What is the importance of calculation of crack width and list out the parameters influencing the crack width of beams. [3]

PART - B

(50 Marks)

- 2.a) Derive an expression for the moment of resistance of a rectangular section ' $B \times d$ '. Assume M 20 grade concrete and Fe 415 grade steel reinforcement. Use limit state method of design.
- b) A reinforced concrete simply supported rectangular beam of effective span 5 m and size 230 mm $\times$ 450 mm effective depth is reinforced with 4 bars of 16 mm diameter. Determine the safe uniformly distributed load the beam can resist in addition to its self-weight. Use M 25 concrete and Fe 415 steel. Adopt limit state method of design. [4+6]

OR

3. A reinforced concrete slab of thickness 125 mm is supported by simply supported beams of span 4.8 m and overall size 230 mm $\times$ 400 mm. The beams are spaced at 3.6 m c/c and reinforced with 4 bars of 20 mm diameter. Determine the moment of resistance of the T-beam section. Use M 20 concrete and Fe 415 steel. Adopt limit state method of design. [10]
4. A rectangular reinforced concrete beam of size 300 mm $\times$ 500 mm, overall depth, is subjected to an ultimate moment of 150 kNm, a factored shear force of 100 kN and a factored torsional moment of 50 kNm. Design the beam and sketch the reinforcement details. Use M 25 concrete and Fe 415 steel. [10]

OR

5. A two span continuous beam with simple supports, each span of 6 m, is subjected to a characteristic dead load of 25 kN/m and characteristic live load of 40 kN/m. Design the beam and draw the reinforcement details. [10]
6. Design the reinforcement for a column of section 350 mm × 350 mm, subjected to a factored axial load of 1200 kN and a factored moment of 150 kNm. Use M 25 grade concrete and Fe 415 steel. The effective length of the column is 3.6 m. [10]

OR

7. Design the reinforcement of a column of size 350 mm × 400 mm subjected to a factored axial load of 1600 kN and factored moments of 50 kNm and 40 kNm with respect to the major and minor centroidal axes respectively at the top. The moments at the bottom end equal to 75 % of the corresponding values at the top. Assume the column is bent in double curvature and the effective length of the column is 6.6 m. Use M 25 grade concrete and Fe 415 steel. [10]
8. Design the circular footing for a column of 450 mm diameter carrying an axial load of 900 kN. The effective length of the column is 4.5 m. Assume the bearing capacity of soil is 200 kN/m². Use M 20 concrete and Fe 415 steel. [10]
- OR**
9. Design a combined footing for two columns, 400 mm × 400 mm supporting an axial load of 900 kN and 500 mm × 500 mm supporting an axial load of 1200 kN. These two columns are 5 m apart. The safe bearing capacity of the soil is 180 kN/m². Use M 25 concrete and Fe 415 steel. [10]
10. Design an RCC slab of clear dimensions 4 m × 5 m with all four edges continuous. The slab is subjected to live load of 4 kN/m² and floor finish of 1 kN/m². Assume the width of the supports is 300 mm. Use M 25 grade concrete and Fe 415 steel. Sketch the reinforcement details. [10]

OR

11. A simply supported reinforced concrete beam of effective span 6 m has cross-section 230 mm × 500 mm overall depth is reinforced with 4 bars of 16 mm diameter in tension and 2 bars of 12 mm diameter in compression. The beam is subjected to a superimposed working load of 30 kN/m. Determine the short term and long term deflections. Adopt M 25 grade concrete and Fe 415 steel. [10]

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