

R22

Code No: 185EN

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, January - 2025

STRUCTURAL ENGINEERING – I (RCC)

(Civil Engineering)

Time: 3 Hours

Max. Marks: 60

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

i) Part- A for 10 marks, ii) Part - B for 50 marks.

- Part-A is a compulsory question which consists of ten sub-questions from all units carrying equal marks.
- Part-B consists of ten questions (numbered from 2 to 11) carrying 10 marks each. From each unit, there are two questions and the student should answer one of them. Hence, the student should answer five questions from Part-B.
- **Use of only IS 456 and the design charts for columns from sp16 is allowed.**

PART - A

(10 Marks)

- 1.a) Define the term stability with respect to structures. [1]
- b) What are the various limit states generally adopted in the design of structures? [1]
- c) What is an anchorage length of a reinforcement bar? [1]
- d) What is a bond failure? [1]
- e) What is a two-way slab? [1]
- f) What are the parameters influencing the long-term deflections of an RCC beam? [1]
- g) What is the mode of failure of long columns? [1]
- h) What is an uni-axial bending of a column? [1]
- i) What is a footing? [1]
- j) What is a two-way shear in the design of footings? [1]

PART - B

(50 Marks)

2. A reinforced concrete slab of thickness 100 mm is supported by simply supported beams of span 4.8 m and overall size 230 mm × 400 mm. The beams are spaced at 3 m c/c and reinforced with 4 bars of 20 mm diameter in tension. Determine the moment of resistance of the T-beam section. Use M30 concrete and Fe415 steel. [10]

OR

3. Design a reinforced concrete beam section is subjected to an ultimate bending moment of 180 kNm. The overall size of the section is limited to 300 mm×450 mm. Use M25 concrete and Fe415 steel reinforcement. Sketch the reinforcement details. [10]

4. Design an RCC beam section, 230 mm×450 mm, subjected to an ultimate bending moment of 90 kNm and ultimate twisting moment of 45 kNm in addition to an ultimate shear force of 120 kN. Adopt M30 grade concrete and Fe500 steel. Sketch the reinforcement details. [10]

OR

5. Design the shear reinforcement for a simply supported beam of cross-section 230 mm×400 mm and effective span 4.5 m subjected to an imposed load of 30 kN/m. The beam is reinforced with 4-20 mm diameter bars of grade Fe500. Use M30 grade concrete. Sketch the reinforcement details. [10]

6. Design an RCC slab of size 5 m × 6 m with four edges continuous. The slab is subjected to a live load of 4 kN/m². Use M30 grade concrete and Fe500 steel. Sketch the reinforcement details. [10]

OR

7. A simply supported RCC beam of effective span 5.4 m has the cross-section 230 mm × 350 mm and is reinforced with 3 bars of 20 diameter in tension and 2 bars of 10 mm diameter in compression. The beam is subjected to a superimposed working load of 30 kN/m. Determine the maximum deflection. Adopt M25 grade concrete and Fe500 steel. [10]

8. Design the reinforcement of a column, 400 mm×500 mm, of height 4.2 m subjected to a factored axial load of 1500 kN along with ultimate moments of 120 kNm and 90 kNm about major and minor axes, respectively. Use M30 concrete and Fe500 steel. Sketch the reinforcement details. [10]

OR

9. Determine the ultimate load carrying capacity of a column of a square column of side 300 mm and reinforced with 6 bars of 20 mm diameter. The unsupported length of the column is 6 m and effective length factor is 0.7. Use M30 concrete and Fe500 steel. [10]

10. Design the footing for a column 300 mm×300 mm subjected to an axial load of 1000 kN. Assume the bearing capacity of soil is 250 kN/m². Use M25 concrete and Fe500 steel. Sketch the reinforcement details. [10]

OR

11. Design a combined footing for two square columns of size 300 mm and 450 mm which are 4 m apart and carries axial loads 750 kN and 1250 kN, respectively. The maximum projection beyond the face of each column is restricted to 450 mm. The safe bearing capacity of soil is 300 kN/m². Use M30 grade concrete and Fe500 steel. [10]

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