B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2003

Sixth Semester.

Civil Engineering

CE 337 — STRUCTURAL DESIGN — II

Time : Three hours

Maximum : 100 marks

Use of IS : 456, Design Aids SP : 16 and IS : 1905 is permitted

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State the assumptions made in working stress method.

2. What is modular ratio? Determine the modular ratio of M25 grade concrete.

3. Find the depth of neutral axis in terms of 'd' for a balanced section using Fe 415 steel, in limit state method.

4. What is the difference in the design of one way and two way slabs?

5. When shear reinforcement is necessary in a beam?

6. What is bond stress? Write an expression for it.

7. How do you classify a column as short or long?

8. Write the procedure for the design of an axially loaded short column.

9. Under what circumstances a trapezoidal footing becomes necessary?

10. What is slenderness ratio for a masonry wall? State the maximum values.

PART B — (5 × 16 = 80 marks)

11. Design a rectangular beam section subjected to an ultimate moment of 120 kN m. Use concrete M20 and steel Fe 415. Adopt limit state method.

12. (a) A rectangular beam of width 300 mm and effective depth 500 mm is reinforced with 4 bars of 12 mm diameter. Find the moment of resistance and stresses in the top compression fibre of concrete and tension steel. Use concrete M20 and steel Fe 415. Adopt working stress method.

Or

(b) Design the interior span of a continuous one way slab for an office floor continuous over Tee beams spaced at 3 m centres. Live load = 4 kN/m², Floor finish = 1 kN/m². Use concrete M 20 and steel Fe 415. Adopt limit state method. Sketch the steel reinforcement.

13. (a) A rectangular beam of width 250 mm and effective depth 500 mm is reinforced with 4 bars of 20 mm diameter. Determine the shear reinforcement required to resist a shear force of 150 kN. Use concrete M 20 and steel Fe 415.

Or

(b) Design a rectangular beam section of width 250 mm and effective depth 500 mm, subjected to an ultimate moment of 160 kN m, ultimate shear force of 30 kN and ultimate torsional moment of 10 kN m. Use concrete M 20 and steel Fe 415.

14. (a) Design a circular column with helical reinforcement, of 400 mm diameter and 4 m in length to carry a factored load of 1000 kN. The column is hinged at both ends. Use concrete M 25 and steel Fe 415.

Or

(b) A column 300 mm × 400 mm has an unsupported length of 4 m and fixed at both ends. It is subjected to a factored load of 1000 kN and an ultimate moment of 200 kN m about the major axis. Determine the longitudinal reinforcement and lateral ties. Use concrete M 25 and steel Fe 415. d' = 60 mm.

15. (a) A rectangular column 300 mm × 400 mm reinforced with 20 mm diameter bars, carries a load of 1400 kN. Design a suitable footing for the column. The safe bearing capacity of the soil is 200 kN/m². Use concrete M 20 and steel Fe 415.

Or

(b) Design a combined rectangular footing for two columns spaced at 5 cm centres. The first column 400 mm × 400 mm carries a load of 1200 kN and the second column 450 mm × 450 mm carries a load of 1800 kN at service state. Weight of soil = 20 kN/m³, angle of repose = 30° and safe bearing capacity of soil = 150 kN/m². Use concrete M 20 and steel Fe 415.

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