Reg. No. : ⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚ .

Question Paper Code : 70354

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2023.

Fifth Semester

Civil Engineering

CE 8501 — DESIGN OF REINFORCED CEMENT CONCRETE ELEMENTS

(Regulations 2017)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1.   Write the IS code numbers for Dead load, Live Load,. Earthquake load and Crane loads.

2.   Mention the FOS for Concrete and Steel.

3.   State the equation provided in IS 456 for the design of stirrups for tension.

4.   Why is the yield strength of stirrup reinforcement restricted in the codes?

5.   List the reinforcement detailing rules for restrained two-way slabs as per Annexure D of IS 456.

6.   Under what situations will there be unbalanced moments in the slab boundaries.

7.   What is the minimum number of bars to be provided in rectangular or square columns in earthquake zones? Is it different from the IS 456 Provision.

8.   List the parameters that affect the confining reinforcement.

9.   Discuss about the behavior of combined two-column footings.

10. What is meant by negative skin friction?

PART B — (5 × 13 = 65 marks)

11. (a) Design a balanced singly reinforced concrete beam section for an applied moment of 60 kNm. The width of the beam is limited to 175 mm. Use M20 and -Fe415 steel bars (Limit state method). (13)

Or

(b) Write down the properties of concrete and reinforcing steel. (13)

12. (a) Determine the cracking torque of a rectangular concrete beam of size 250mm × 500mm. Assuming M25 Grade concrete using (13)

(i) Plastic Theory

(ii) IS code and

(iii) ACI Code.

Or

(b) Determine the moment of resistance of the following T- beam:

Breadth of flange = 500mm, effective depth = 400mm, breadth of the web = 230mm, thickness of the flange = 85mm, 5 no's of 20 mm diameter bars are provided. Use M25 concrete and Fe415 steel. (13)

13. (a) Design a simply supported slab with effective short and long span of 4m × 6m respectively is subjected to an imposed load of 3kN/m². An opening of 500mm × 500mm is to be provided in the slab at the centre of the slab. Design the slab using M20 concrete and Fe415 steel. (13)

Or

(b) A dog-legged staircase is proposed to construct for a building in which the vertical distance between floors is 3.0m. The stair hall measures 3m × 3m. The live load is 3800N/m². Use M20 concrete and Fe415 steel bars. (13)

14. (a) Design a short axially loaded square column, 400mm × 400mm for a service load of 1500 kN. Use M30 concrete and Fe415 steel bars. (13)

Or

(b) Design a circular column which is subjected to an un-factored load of 2500kN. The effective length of the column is 2.5m. Use M30 concrete and Fe415 steel bars. (13)

15. (a) Design a RC wall footing to carry a DL of 120kN/m and LL of 80kN/m. The allowable soil pressure q_a is 200kN/m² at a depth of 1.5m below ground. Density of soil is 20kN/m³. (13)

Or

(b) Design a sloped square footing for a rectangular column of size 300mm ×400mm and subjected to an un-factored load of 1000kN. Assume SBC of soil as 200kN/m². Assume M25 Grade concrete and Fe 415 steel. (13)

PART C — (1 × 15 = 15 marks)

16. (a) Design a simply supported slab to cover a room with internal dimensions of 4.0m × 5.0m and 230mm thick brick walls all around. Assume alive load of 3kN/m² and a finish load of 1kN/m². Use M25 concrete and Fe415 steel. Assume that slab corners are free lift up. Assume mild exposure conditions. (15)

Or

(b) Design a rectangular combined footing to support 2 columns of size 450 mm × 450 mm (20 mm dia bars) and 600mm × 600mm (25mm dia bars) carrying 1000kN and 1400kN. The columns are located 4m apart and the column carrying 1000kN in flush with the property line. Assume SBC of soil as 200kN/m². Assume M25 Grade concrete and Fe415 steel. (15)