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Question Paper Code : 80358

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2024

Fifth Semester

Civil Engineering

CE 8501 – DESIGN OF REINFORCED CEMENT CONCRETE ELEMENTS

(Regulations 2017)

Time : Three hours   Maximum : 100 marks

IS456 : 2000 may be permitted

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the different types of loads that have to be considered in the design of a building?

2. Justify any two guidelines to select the cross sectional dimensions of RC beam.

3. Write the formula for effective flange width of isolated L-beam and T-beam?

4. Enlist the types of shear failure in reinforced concrete beams.

5. Why corner reinforcement are provided in a two way slab? Sketch the edge and middle strips of a two way slab.

6. Mention the parameters governing slab moment's coefficients.

7. Write about the function of lateral ties in a RC column.

8. Sketch the salient points on a typical axial – moment interaction curve of a column.

9. Why dowel bars are provided in footing?

10. Sketch the placement of steel in rectangular footing with a noncentral load.

PART B — (5 × 13 = 65 marks)

11. (a) Explain the detailed design procedure of singly reinforced rectangular beam by WSM.   (13)

Or

  (b) Design a rectangular section for a simply supported RC beam of effective span of 4 m carrying a concentrated load of 35 kN at its mid span. The concrete to be used is of grade M 20 and the reinforcement consists of Fe 415 steel bars.

     (i) Self-weight of beam is ignored.   (7)

     (ii) Self-weight of beam is considered. Choose working stress method. (6)

12. (a) A rectangular beam of 300 mm wide is reinforced with 4 nos. 25 mm dia at an effective depth of 600 mm. A beam has to resistant of factored shear force of 400 KN @ support section. Assume f_{ck} = 20 N/mm^2; f_y = 415 N/mm^2. Design the vertical stirrups.   (13)

Or

  (b) Check for the development length at support of a doubly reinforced beam 400 mm × 750 mm the clear span of the beam is 5.0 m. The beam carries UDL of 46 kN/m (including self-weight). The beam is reinforced with 8 bars of 20 mm diameter (4 bars are bent up near support) on tension side and 4 bars of 16 mm diameter on compression side. Adopt M 20 grade of concrete and Fe 500 bars.   (13)

13. (a) Design a two way slab for an office floor size 3.5 m × 4.5 m with discontinuous and simply supported edges on all the sides with the corners prevented from lifting and supporting a service live load of 4.4 kN/m^2. Adopt M20 grade and Fe 415 HYSD bars.   (13)

Or

  (b) Design one of the flights of a dog-legged stairs spanning between landing beams using following data :   (13)

     Number of steps in a flight = 10, Tread = 300 mm, Rise = 150 mm

     Width of landing beams = 300 mm

14. (a) Design a short rectangular column subjected to a factored load of 2000 kN and a factored moment of 120 kNm. Adopt M30 concrete and Fe 500 grade steel and assume mild environment.

Or

(b) Design a biaxially loaded braced circular column for the following data Factored axial load, P_u = 2000 kN, ultimate biaxial moments : M_{ux} = 250 kNm and M_{uy} = 150 kNm, unsupported length of 3.25 m and column diameter is 500 mm. Use M 25 Grade of concrete and Fe 500 steel. (13)

15. (a) Design a sloped square footing for a rectangular column of size 350 mm × 450 mm and subjected to an unfactored load of 1200 kN. Assume SBC as 300 kN/m². Use M 25 grade concrete and Fe 500 steel. (13)

Or

(b) Design a plain concrete footing for a column of size 300 mm × 300 mm carrying a service load of 300 kN. Assume allowable soil pressure of 250 kN/m² at 1.2 m below ground level. Assume M 20 concrete and Fe 415 steel. (13)

PART C — (1 × 15 = 15 marks)

16. (a) Design a cantilever portico slab of 5 m width and 1.8 m clear span. Assume moderate environment with M 25 and Fe 500. (15)

Or

(b) Calculate the ultimate moment of resistance of a singly reinforced T beam having flange width of 1200 mm, flange thickness of 120 mm and rib width of 300 mm, the effective depth of beam is 600 mm. The beam is reinforced with 8 numbers of 25 mm diameter made of Fe 415 steel bars. The grade of concrete is M 20. (15)

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