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Question Paper Code : 21210

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

Fifth Semester

Civil Engineering

CE 2306/CE 55/CE 1302/10111 CE 506 — DESIGN OF RC ELEMENTS

(Regulation 2008/2010)

Time : Three hours Maximum : 100 marks

(IS 456–2000 and SP 16 Design charts Tables are permitted)

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define collapse state.

2. Enlist different factors that are influencing the durability of concrete as per BIS.

3. Sketch the edge and middle strip of one way slab.

4. What is doubly reinforced beam?

5. Write down the effect of torsion in RC beams.

6. Write about local bond and anchorage length.

7. What is pedestal?

8. Write down the expression for minimum eccentricity.

9. State the Rankine's equation to determine the minimum depth of foundation.

10. When is the combined footing provided?

PART B — (5 × 16 = 80 marks)

11. (a) Explain the concept of elastic method and ultimate load method and write the advantages of limit state method over other methods. (16)

Or

(b) Derive the expression for the depth of neutral axis and moment of resistance of a rectangular singly reinforced balanced beam section under flexure. Use M15 concrete and mild steel. (16)

12. (a) What are the different steps involved in the design of flanged beam? (16)

Or

(b) Design a one way slab for the following data: Size = 3 m × 9 m, Width of the supports = 230 mm, Live load — 3 kN/ m^2, Floor finish as kN / m^2. Use M 20 concrete and Fe 415 steel. (16)

13. (a) Derive the expression to determine the shear strength of RC section. (16)

Or

(b) An overhanging beam has 6m span from support to support and 2m overhanging. The cross section of the beam is 300 mm × 500mm and the design load applied through was 40 kN/m. 4 bars of 20 mm diameter plain bars are provided with 50 mm effective cover. What is the maximum bond stress developed and find the anchorage length required for the overhanging portion. (16)

14. (a) Design a column, 4m long restrained in position and direction at both ends to carry an axial load of 1600 kN. Use M20 concrete and Fe415 steel. (16)

Or

(b) Design a column of size 450mm × 300mm. Use M30 concrete and Fe415 steel. Take l_{ex} = 6 m, l_{ey} = 5.5m, P_u = 1600kN, M_{ux} = 45kN-m at top and 40kN-m at bottom. M_{uy} = 40kN-m at top and 25 kN-m at bottom. The column is bent in double curvature and assume a cover of 50 mm. (16)

15. (a) Write down the design steps in detail of a rectangular combined footing. (16)

Or

(b) Design a RC combined rectangular footing for two columns located 3.6 m apart. The overall size of the columns are 400 mm × 400 mm and 600 mm × 600 mm and the loads are 1000 kN and 1500 kN respectively. The space available for width of the footing restricted to 1800 mm. The safe bearing capacity of soil is 280 kN/m^2. Use M15 concrete and Fe415 steel. (16)
