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Question Paper Code : 90329

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

Fifth Semester

Civil Engineering

CE 8501 – DESIGN OF REINFORCED CEMENT CONCRETE ELEMENTS

(Regulations 2017)

Time : Three hours Maximum : 100 marks

(Use of IS 456 : 2000 Code Book is permitted)

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Write any two assumptions made in elastic theory method.

2. What is the formula used to find the critical neutral axis in working stress method?

3. Write any two guidelines to select the cross sectional dimensions of reinforced concrete beams?

4. Calculate the development length of 10 mm diameter bars in M25 concrete if the steel is

   (a) Mild steel with $\sigma_s = 230$ N/mm²

   (b) Tor steel with $\sigma_s = 415$ N/mm²

5. Why should we provide minimum reinforcements in R.C.C beams?

6. Write down the effective width formula, when a single concentrated load acts over the slab?

7. What is meant by braced beams?

8. How do the compression failures occur in columns?

9. What is meant by proportioning of footing?

10. Under what circumstances combined rectangular footings are suitable?

PART B — (5 × 13 = 65 marks)

11. (a) Explain the various codal recommendations for limit state design. (13)

Or

(b) Design a rectangular section for a simply supported reinforced concrete beam of effective span of 5m carrying a concentrated load of 40 kN at its mid san. The concrete to be used is grade of M20 and the reinforcement consist of Fe 415 steel bars.

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

(ii) Self-weight of the beam is considered.

Use working stress method. (13)

12. (a) A T-beam slab floor of an office comprises of a slab 150 mm thick spanning between ribs spaced at 3 m centres. The effective span of the beam is 8 m. Live load on floor is 4 kN/m^2, Using M20 grade and Fe 415 HYSD bars. Design one of the intermediate tee beams. Use limit state method. (13)

Or

(b) Design a shear of rectangular reinforced concrete beam section to carry a factored bending moment of 200 kNm, factored shear force of 120 kN, and a factored torsional moment of 75 kNm. Use M20 grade concrete Fe 415 steel. (13)

13. (a) Design a slab over a room 5 m × 7 m as per I.S Code. The slab is supported on masonry walls all round with adequate restraint and the corners are held down. The live load on the slab is 300 kN/m^2. The slab has a bearing of 150 mm on the supporting wall. (13)

Or

(b) 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)

14. (a) Design the reinforcements in a circular column of diameter 300 mm to support a service axial load of 800 kN. The column has an unsupported length of 3 m and is braced against side sway. The column is reinforced with helical ties. The materials to be used are M25 grade of concrete and HYSD steel bars of grade Fe415. (13)

Or

(b) Design the reinforcements in a short column 400 mm × 400 mm at the corner of a multi storeyed building to support an axial factored load of 1500 kN, together with biaxial moments of 50 kN.m acting in perpendicular planes. Adopt M20 grade of concrete and steel grade Fe 415 HYSD bars. (13)

15. (a) (i) Write down the different types of footings and their suitability. (7)

(ii) Enumerate the procedure for the design of combined rectangular footing for two columns only. (6)

Or

(b) Design the isolated footing for an square column, 450 mm × 450 mm, reinforced with 8 Nos -25 mm dia bars, and carrying a service load of 2300 kN. Assume soil with a SBC (Gross) of 300 kN/m^2 at a depth of 1.5m below ground. Assume M20 grade of concrete and steel grade Fe 415 for the footing, and M25 grade of concrete and steel grade Fe415 for the column. (13)

PART C — (1 × 15 = 15 marks)

16. (a) A reinforced concrete beam reinforced with 4 Nos – 12 mm dia bars has a width of 100 mm and effective depth of 200 mm. The maximum shear force applied is 30 kN. Find the local bond stress and the development length of the tension bars. The permissible stress in concrete is 10 MPa. and that of steel is 140 MPa. (15)

Or

(b) A 230 mm thick masonry wall is to be provided with a reinforced concrete footing on a site having soil with SBC, unit weight and angle of repose of 125 kN/m^2, 17.5 kN/m^3, and 30° respectively. Use M20 grade of concrete and HYSD bars of grade Fe415. Design the footing when the wall supports at service state a load of 150 kN/m length. (15)

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