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10CV/CT52

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021
Design of RCC Structural Elements

Time: 3 hrs.   Max. Marks:100

Note: **1.** *Answer any FIVE full questions, selecting at least TWO questions from each part.*
        2. *Use of IS456-2000 and SP16 is permitted.*

PART – A

1 a. Explain working stress method and limit state method of RCC design. **(04 Marks)**
   b. Explain the terms balanced, over reinforces and under reinforced section in beam subjected to flexure with neat sketches. Which of these should be recommended in design? Why?
   (06 Marks)
   c. Define:
      (i)   Characteristic strength
      (ii) Design strength
      (iii) Characteristic load
      (iv) Design load
      (v)   Factor of safety **(10 Marks)**

2 a. A rectangular section of effective size 230 mm × 500 mm is used as a simply supported beam for an effective span of 6.3 m. what maximum total udl can be allowed on the beam if the maximum percentage of steel provided only on the tension side. Use M_{25} concrete and FE_{415} steel. **(10 Marks)**
   b. Determine the ultimate moment capacity of a doubly reinforced beam with width = 350 mm, effective cover for both reinforcement = 60 mm. Effective depth = 550 mm, area of compression steel = 1690 mm^2, area of tension steel = 4310 mm^2. Use M_{30} concrete and Fe_{415} Steel. **(10 Marks)**

3 a. What are the factors affecting the short term and long term deflections? **(06 Marks)**
   b. A cantilever beam of span 3m has a cross section of 250 mm × 500 mm. It is reinforced with 4 bars of 20 mm diameter on tension side and 2 bars of 20 mm on compression side, with effective cover of 50 mm on both sides. Determine the deflection at free end, if it is subjected to a total service load (including self weight) of 30 kN/m. Use M_{25} grade concrete and Fe_{415} steel. **(14 Marks)**

4 A hall 16m × 6m is provided with T-beam and slab. T beams are spaced 4 m c/c, slab thickness is 120 mm. Live load = 5 kN/m^2 (including self weight). Design an intermediate beam. Use M_{20} concrete and Fe_{415} steel. Assume bearing of 500 mm. Check the beam for deflection and bond. **(20 Marks)**

PART – B

5 A hall has clear dimensions 3m × 9m with wall thickness 230 mm. The live load on the slab is 3 kN/m^2 and finishing load 1 kN/m^2 may be assumed. Use M_{20} grade concrete and Fe_{415} steel. Design the slab, check for shear and deflection. **(20 Marks)**

6   a.   Write the specifications for longitudinal and transverse reinforcement of column as per IS456-2000. **(04 Marks)**

    b.   Differentiate between long column and short column. **(02 Marks)**

    c.   Design a circular pin ended column 400 mm diameter and helically reinforced with an unsupported length of 4.5 m to carry a factored load 900 kN. Assume M_{30} concrete and Fe_{415} steel. **(14 Marks)**

7   Design an isolated rectangular footing of uniform thickness for column 300 mm × 600 mm. The column is carrying a service load of 1200 kN. The bearing pressure of soil is 200 kN/m^2. Use M_{20} concrete and Fe_{415} steel. **(20 Marks)**

8   The clear dimensions of a staircase is 2.4 m × 4.75 m. Floor to floor height is 3.5 m. Design an intermediate flight of a dog legged stair using M_{20} concrete and Fe_{415} steel. The live load is 3 kN/m^2. Assume the langing span in the same direction as the stair and supported on the walls at the ends. Wall thickness = 300 mm. **(20 Marks)**

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