CBCS SCHEME

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18CV53

Fifth Semester B.E. Degree Examination, Dec.2024/Jan.2025
Design of RC Structural Elements

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of IS:456-2000, SP-16 is permitted.

Module-1

1 a. Briefly explain the philosophy and principles of limit state method of RCC design. **(08 Marks)**

b. Write a brief notes on:
i) Characteristic loads
ii) Characteristic strength
iii) Balanced section
iv) Over reinforced section. **(12 Marks)**

OR

2 a. List the factors that affect the deflection of reinforced concrete members. **(04 Marks)**

b. A rectangular section beam 200 mm × 450 mm is reinforced with 3 bars of 16 mm diameter at an effective depth of 420 mm and with 2 bars of 12 mm hanger bars. The effective span of the beam is 5 m. The beam supports a service live load of 10 kN/m. If f_{ck} = 20 N/mm^2, f_y = 415 N/mm^2. Compute: i) The short term deflection ii) The long term deflection as per IS:456 code specifications. **(16 Marks)**

Module-2

3 a. A doubly reinforced concrete beam having a rectangular section 250 mm × 540 mm overall depth is reinforced with 2 bars of 12 mm hanger bars and 4 bars of 20 mm diameter in tension zone. Use effective cover as 40 mm, M20 grade concrete, Fe 415 HYSD bars. Estimate the flexural strength of section as per codal provisions. **(10 Marks)**

b. A reinforced concrete beam of rectangular section has a width of 250 mm and an effective depth of 500 mm. The beam is reinforced with 4 bars of 25 mm diameter on the tension side. Two of the tension bars are bent up @ 45° near the support section. In addition the beam is provided with two legged stirrups of 8 mm diameter at 150 mm c/c. If fck = 25 N/mm^2, fy = 415 N/mm^2. Calculate ultimate shear strength of the section. **(10 Marks)**

OR

4 a. Determine the area of tensile reinforcement required in a flanges beam having width of flange 750 mm, width of rib 300 mm, thickness of flange 120 mm, effective depth 600 mm to support a factored moment of 300 kN-m. Use M-20 grade concrete and Fe-415 HYSD bars. **(10 Marks)**

b. A reinforced concrete beam of rectangular section 300 mm × 600 mm is reinforced with 4 bars of 25 mm diameter at an effective depth of 550 mm. The effective span of the beam is 7 m, take fy = 415 N/mm^2, fck = 20 N/mm^2. Find the uniformly distributed ultimate load on the beam. **(10 Marks)**

Module-3

5 Design a singly reinforced concrete beam of clear span 5 m to support a design working live load of 10 kN/m. Adopt M-20 grade concrete and Fe-415 HYSD bars. Sketch reinforcement details. **(20 Marks)**

OR

6 A T-beam slab floor of reinforced concrete has a slab 150 mm thick spanning between the T-beams which are spaced 3 m c/c. The beams have a clear span of 10 m and the end bearings are 450 mm thick walls. The live load acting on the floor is 4 kN/m^2. Using M-20 grade concrete, Fe 415 HYSD bars, design one of the intermediate T-beams. **(20 Marks)**

Module-4

7 Design a simply supported R.C.C slab for an office floor having clear dimensions of 4 m × 10 m with 230 mm wall all-round. Adopt M-20 grade concrete and Fe-415 HYSD bars. Show reinforcement details. **(20 Marks)**

OR

8 a. Distinguish between one way slab and two way slab. **(08 Marks)**

b. Design a dog-legged flight of stairs of a commercial building spanning between landing beans. The flight has 12 No.s steps with tread 300 mm, rise 160 mm, width of landing beams 400 mm. Use M20 grade concrete and Fe 415 HYSD bars. Sketch the reinforcement details. **(12 Marks)**

Module-5

9 a. List out different types of columns. **(04 Marks)**

b. Design the reinforcements in a circular column of diameter 300 mm with helical reinforcement to support a factored load of 1500 kN. The columns has an unsupported length of 3 m. Use M-20 grade concrete and Fe-415 HYSD bars. **(16 Marks)**

OR

10 Design a reinforced concrete footing for a rectangular column of section 300 mm × 500 mm supporting an axial factored load of 1500 kN. The SBC of the soil @ site is 185 kN/m^2. Use M-20 grade concrete and Fe 415 HYSD bars. **(20 Marks)**

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