CBCS SCHEME

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18CV53

Fifth Semester B.E. Degree Examination, June/July 2024
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 IS456-2000, SP-16 id permitted.
3. Assume suitable additional data, if necessary.

Module-1

1 a. Explain the terms balanced section, under reinforced section and over reinforced sections in beams, subjected to flexure with neat sketches. **(12 Marks)**

b. What is limit state? Explain different limit states to be considered in the design of RC beams. **(08 Marks)**

OR

2 a. Explain the factors that affect short and long term deflections. **(10 Marks)**

b. Show that $\chi_{u\,max} = 0.46\ d$, for Fe500 steel. **(10 Marks)**

Module-2

3 a. A RC beam of section 230mm×500mm (overall) is reinforced with 4#16 with an effective cover of 40 mm of span 5 m. Find the central point load carrying capacity of the section excluding self-weight. Find the ultimate moment of resistance of the beam. Use M20 and Fe 415 steel. **(10 Marks)**

b. A rectangular beam is 200 mm wide and 500 mm deep. It is reinforced with 4 bars of 25 mm dia bars in compression with an effective cover of 50 mm. Determine the area of tension reinforcement needed to make the beam section fully effective, what then be the M_u? Use M20 concrete and Fe 250 steel. **(10 Marks)**

OR

4 a. Determine the flexural steel reinforcement at mid span for a simply supported beam of effective span of 5.25 m. The characteristic Dead and Live load shall be 15 KN/m and 20 KN/m respectively. The cross sectional dimensions are width 300 mm and effective depth 675 mm. Use M20 concrete and Fe 415 steel **(10 Marks)**

b. A T-Beam has flange dimensions of 1500×120 mm. The width of rib is 250 mm and rib depth is 350 mm. If the beam is reinforced with 1900 mm^2 of steel in tension zone with an effective cover of 40 mm, determine the max allowable UDL inclusive of self weight over a simply supported span of 6 m. Use M20 concrete and Fe415 steel. **(10 Marks)**

Module-3

5 A rectangular beam is to be simply supported on supports of 230 mm width. The clear span of the beam is 6 m. The beam is to have width of 300 mm. The characteristic super imposed load is 12 KN/m. Using M20 concrete and Fe415 steel, design the beam. Sketch the reinforcement details. **(20 Marks)**

OR

6 A T-Beam slab floor has 125 mm thick slab forming part of T-beams which are of 8 m clear span. The end bearing are 450 mm thick. Spacing of T-Beams is 3.5 m. The LL on the floor is 3 kN/m^2. Design one of the intermediate beams. Use M20 concrete and Fe415 steel. Sketch the reinforcement details. **(20 Marks)**

Module-4

7 Design a slab for a room of clear internal dimensions 3m×5m supported on walls of 300 mm thickness with corner held down. Two adjacent edges of the slab are continuous and other two discontinuous. LL = 3 kN/m^2 and FF = 1 kN/m^2. Use M20 concrete and Fe415 grade steel. Sketch the reinforcement details. **(20 Marks)**

OR

8 Design a dog-legged staircase for a public building, given the following data :
Clear dimensions of staircase hall is (3m×5m)
Height between the floors = 3.5 m
Rise = 150 mm ; Tread = 280 mm
Width of flight = landing width = 1.45 m
Assume the stairs to be supported on 230 mm thick masonry walls at the outer edges of the landings, parallel to risers. Use M20 concrete and Fe415 steel. Sketch the reinforcement details. **(20 Marks)**

Module-5

9 a. A 3m height column is effectively held in position at both ends and restrained against rotation at one end. Design the column to carry factored axial load of 3000 kN. Use M20 concrete and Fe415 steel. Sketch the reinforcement details. **(10 Marks)**

b. Design a RCC column (400×400) to carry an ultimate load of 1000 kN and eccentricity 160 mm. Use M25 grade concrete and Fe415 grade steel. Sketch the reinforcement details. **(10 Marks)**

OR

10 A square column 400 mm sides carries a load of 900 kN. Design a footing.
SBC of soil = 100 kN/m^2. Adopting M20 and Fe415, show the check for one way, two way shear and bond strength. **(20 Marks)**

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