CBCS SCHEME

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18CV53

Fifth Semester B.E. Degree Examination, Feb./Mar. 2022
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. Assume any missing data.
3. Use of IS-456, SP-16 chart permitted.

Module-1

1   a. Explain the following:
    i)   Partial safety factors for loads and materials.
    ii)   Explain the principles of limit state design.   **(10 Marks)**
    b. Explain under reinforced section, over-reinforced section, balance section with neat sketches and also show that $X_{ulim} = 0.53d$, for Fe250 grade of steel.   **(10 Marks)**

OR

2   a. Briefly explain the step by step procedure for short term deflection and long term deflection.   **(10 Marks)**
    b. A flanged beam of T-section is simply supported over an effective span of 8m. The beam has effective flange width of 1400mm, thickness of flange as 150mm, breadth of web as 300mm and effective depth of 450mm. It is reinforced with 4 bars of 25mm diameter in tension and 3 bars of 16mm diameter in compression, check the beam for deflection. Use M_{20} grade concrete and Fe415 steel.   **(10 Marks)**

Module-2

3   A R.C.C beam of rectangular section 300×600mm is reinforced with 4 bars of 20mm diameter with an effective cover 50mm, effective span of the beam is 6m. Assuming M_{20} concrete and Fe250 steel. Determine the central concentrated load P, that can be carried by the beam in addition to its self weight.   **(20 Marks)**

OR

4   a. Find the steel for a rectangular section 300×600mm to support a load of 80kN/m with span of 6m (effective) and cover 40mm (effective) adopt M_{20} concrete Fe415 steel.   **(10 Marks)**
    b. A singly reinforced beam 250×500mm is reinforced with 4 − 16mm diameter and cover 40mm (effective) with effective span 6m. Determine the central point load that can be applied at mid span adopt M_{20} concrete Fe500 steel.   **(10 Marks)**

Module-3

5   A T-beam slab floor gas 125mm thick slab forming part of T-beam which are of 8m clear span. The end bearing are 450mm thick, spacing of T-beams is 3.5m. The live load on the floor is 3kN/m². Design one of the intermediate beams. Use M_{20} concrete and Fe415 steel.   **(20 Marks)**

OR

6   A rectangular beam is to be simply supported on supports of 300mm width. The clear span of the beam is 6m. The beam is to have width of 230mm. The characteristic superimposed load is 12kN/m. Using M_{20} and Fe500 steel, design the beam and sketch details of reinforcement. **(20 Marks)**

Module-4

7   A hall has clear dimensions 3m × 9m with wall thickness 230mm. The live load on the slab is 3kN/m^2 and finishing load 1kN/m^2 may be assumed. Use M_{20} grade concrete and Fe415 steel. Design the slab, check for shear and deflection. **(20 Marks)**

OR

8   Design a dog-legged stairs for an building in a room measuring 3.6 × 5.2m clear span. The vertical distance between the floors is 3.2m. Consider LL 3kN/m^2. Use M20 concrete and Fe415 grade of steel. Assume stairs are supported on 300mm wall at the outer edges of landing slabs consider Rise = 160mm and Tread = 300mm. **(20 Marks)**

Module-5

9   a. Distinguish between short column and long column. **(05 Marks)**
     b. Design a circular pin ended column 400mm diameter and helically reinforced with an unsupported length 4.5m to carry a factored load 900kN. Assume M_{30} concrete and Fe415 steel. **(15 Marks)**

OR

10   Design a Isolated rectangular footing of uniform depth for the column size of 230mm × 300mm supporting an axial service load of 850kN. The safe bearing capacity of soil is 150kN/m^2. Adopt M_{20} grade concrete and Fe415 grade steel sketch the reinforcement details. **(20 Marks)**

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