CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐

17CV/CT51

Fifth Semester B.E. Degree Examination, June/July 2023
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 code IS456:2000 and SP-16 is permitted.
3. Assume any missing data suitably.

Module-1

1 a. Explain: i) Characteristic load   ii) Characteristic strength   iii) Partial safety factor.
   (06 Marks)
   b. Briefly explain the principles of limit state method of design.   **(06 Marks)**
   c. What is stress block? Derive from the fundamental expressions for the area of stress block $0.36 f_{ck} b x_u$ and depth of centre of compressive force from the extreme fiber in compression $0.42x_u$.   **(08 Marks)**

OR

2 a. Explain: i) Development length of bars   ii) Short term deflection   iii) Longterm Deflection.   **(06 Marks)**
   b. A simply supported beam has a rectangular section and carries a uniformly distributed load of 20kN/m over a clear span of 4.5m. The cross section is 300mm × 550mm and is reinforced with 4 no's of 20mm diameter bar. Assume cover = 20mm and bearing = 300mm. Assuming M20 grade concrete and Fe415 steel. Compute short term and longterm deflection of the beam.   **(14 Marks)**

Module-2

3 a. Differentiate between under reinforced, over reinforced and balanced section.   **(06 Marks)**
   b. A RCC beam of section 300mm × 500mm is reinforced with 4 bars of 16mm diameter with an effective cover of 50mm. The beam is simply supported over a span of 5m. Find the maximum permissible UDL on the beam. Use M20 grade concrete and Fe500 grade steel.   **(14 Marks)**

OR

4 a. A doubly reinforced beam section is 250mm wide and 450mm deep upto the centre of the tensile reinforcement. It is reinforced with 2 # 16mm ϕ as compression steel at an effective cover 50mm and 4# 25mm ϕ as tensile reinforcement, using M20 concrete and Fe250 steel, calculate the ultimate moment of resistance of the beam section.   **(12 Marks)**
   b. A reinforced concrete beam has a support section with a width of 250mm and effective depth of 500mm. The support section is reinforced with 3# of 20mmϕ on the tension side. 2 legged 8mm diameter stirrups are provided at a spacing of 200mm centre to centre. Calculate shear strength of the support section for M20 grade concrete and Fe415 steel.   **(08 Marks)**

Module-3

5   A rectangular beam is to be simply supported on supports of 230mm width. The clear span of the beam is 6m. The beam is to have width of 300mm. The super imposed load is 12kN/m. Using M20 concrete and Fe415 steel. Design the beam. Apply check for deflection.
(20 Marks)

OR

6   Design a rectangular beam of section of 230mm × 600mm of effective span 6m. Effective cover of reinforcement should be kept as 50mm. Imposed load on the beam is 40kN/m. Use M20 grade concrete and Fe415 steel.
(20 Marks)

Module-4

7   Design a interior panel of a two way slab of size 5m × 5m. Live load = $3kN/m^2$, floor finish load = $1kN/m^2$ and bearing = 300mm. Adopt M20 grade concrete and Fe415 grade steel. Sketch the reinforcement details in plan.
(20 Marks)

OR

8   Design a dog legged stairs for an office building in a room measuring 2.8m × 5.8m clear vertical distance between the floor is 3.6m. Width of flight is to be 1.25m. Allow a live load of $3kN/m^2$. Sketch the details of reinforcement. Use M20 concrete and Fe415 steel. Assume the stairs are supported on 230mm walls at the end of outer edges of landing slabs.
(20 Marks)

Module-5

9 a. Design the reinforcement for a square column of size 450mm × 450mm to support a service load of 1500kN. Use M20 concrete and Fe415 steel.
(10 Marks)

    b. A column size of 300mm × 400mm has an effective length of 3.6m and is subjected to P_u = 1100kN and M_u = 150kN-m, about the major axis, assuming the bars on two sides, design the column using M25 concrete and Fe415 steel.
(10 Marks)

OR

10 Design an isolated footing of uniform thickness of a RC column, bearing a vertical load of 600kN and having a base of size 500mm × 500mm. The safe bearing capacity of the soil may be taken as $120kN/m^2$. Use M20 grade concrete and Fe-415 grade steel. Sketch the reinforcement details.
(20 Marks)

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