USN | | | | | | | | | |

15CV51

Fifth Semester B.E. Degree Examination, Feb./Mar. 2022
Design of RC Structural Elements

Time: 3 hrs.   Max. Marks: 80

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

Module-1

1   a. Explain the principles of limit state design.   **(06 Marks)**
     b. A simply supported rectangular beam is 12m span has an effective depth of 800mm. The area of tension reinforcement required to support the loads is designed as 1.6 percent. Check the deflection control of the beam by emperical method if
        (i) Fe415 grade HYSD bars.
        (ii) Fe500 grade HYSD bars.   **(10 Marks)**

OR

2   a. List the factors influencing deflection of RC beam.   **(06 Marks)**
     b. Explain the following :
        (i) Partial safety factors for loads.
        (ii) Partial safety factors for materials
        (iii) Characteristic load
        (iv) Characteristic strength   **(10 Marks)**

Module-2

3   a. Define doubly reinforced beam. List the situations which require the adoption of a doubly reinforced beam.   **(06 Marks)**
     b. A simply reinforced concrete beam 250mm wide is reinforced with 4 bars of 25mm diameter at an effective depth of 400mm. Compute ultimate moment of resistance. Use M_{20} grade concrete and Fe415 steel.   **(10 Marks)**

OR

4   a. Differentiate between under reinforced, over reinforced and balanced section.   **(06 Marks)**
     b. Determine the M.R of a T-section having the following details.
            Width of flange = 2500 mm
            Depth of flange = 150 mm
            Width of rib = 300 mm
            Effective depth = 800 mm
            Area of steel = 8 bars of 25mm diameter
        Materials : M_{20} grade concrete
                    Fe415 HYSD bars.   **(10 Marks)**

Module-3

5   a. How to calculate the minimum and maximum area of tension reinforcement in beams.
                                                                                    (04 Marks)

b. Design a singly reinforced concrete beam for the following data:
   Clear span = 3 m
   Simple supports width = 200 mm
   Working load on beam = 6 kN/m
   M_{20} grade concrete
   Fe415 grade HYSD bars. (12 Marks)

OR

6 Design a cantilever beam for the following data:
   Clear span = 3 m
   Working live load = 15 kN/m
   Cantilever beam is monolithic with reinforced concrete column 300mm × 600mm
   f_{ck} = 20 N/mm^2
   f_y = 415 N/mm^2 (16 Marks)

Module-4

7 a. Distinguish between Doglegged stair and open well stair. (04 Marks)
  b. Design a cantilever slab to carry a live load of 3 kN/m^2. The overhang of the slab is 1.25m. Use M_{20} concrete and Fe415 steel. (12 Marks)

OR

8 Design one of the flights of stairs of a school building spanning between landing beams to the following data:
   Type of stair : Dog legged with waist slab treads and risers
   Number of steps in the flight : 12
   Tread T = 300mm
   Rise R = 150mm
   Width of landing beams = 300mm
   M_{20} grade concrete
   Fe415 HYSD bars. (16 Marks)

Module-5

9 a. What are the codal guidelines for determining longitudinal and lateral reinforcements in column? (06 Marks)
  b. Design the reinforcement in a circular column of diameter to support a factored load of 800kN together with a factored moment of 80 kN-m. Adopt M_{20} grade concrete and Fe415 HYSD bars. (10 Marks)

OR

10 A rectangular column 450mm × 600mm carries an axial load of 1200 kN. Design a rectangular footing using M_{20} concrete and Fe415 grade steel. Take SBC of soil = 200 kN/m^2. (16 Marks)

* * * * *