CBCS SCHEME

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17CV51

Fifth Semester B.E. Degree Examination, July/August 2022
Design of R.C. 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 , SP16 allowed.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Differentiate between Working Stress method and Limit State Method of RCC design. **(06 Marks)**

b. Explain i) Characteristic load ii) Characteristic strength. **(04 Marks)**

c. Derive the expression for the area of stress block $0.36\ f_{ac}\ bx_u$ and depth of centre of compressive force from the extreme fibre in compression $0.42x_u$. **(10 Marks)**

OR

2 a. Explain the factors affecting Short Term and Long term deflection. **(06 Marks)**

b. A simply supported beam of rectangular section 200 × 450mm overall is reinforced with 3-16mm diameter on tension side at effective depth 420mm spaced @ 50mm centres. The beam supports a load of 10kN/m , Effective span = 5m. Check the beam for limit state of serviceability of cracking by IS – 465 – 2000 method. **(14 Marks)**

Module-2

3 a. Differentiate between Under reinforced, Over reinforced and Balanced section. **(06 Marks)**

b. Find the depth of Neutral axis of a singly reinforced RC beam of 250mm wide 550mm overall depth. It is reinforced with 4 – bars of 20mm diameter. Use M_{20} concrete and Fe415 steel. Also check for type of section. Take clear cover as 40mm. **(04 Marks)**

c. A Doubly reinforced beam section is 250mm wide , 500mm deep to the centre of the tensile reinforcement. It is reinforced with 3 bars of 16mm diameter as compression reinforcement at an effective cover of 50mm and 4 bars of 20mm diameter as tensile reinforcement. Using M_{20} concrete and Fe500 steel. Calculate the moment of Resistance. **(10 Marks)**

OR

4 a. A Doubly reinforced rectangular beam of size 300mm × 600mm, Simply supported at both the ends. The effective cover for both tension and compression steel is 35mm. The effective span is 6.0m. The beam carries a super imposed load of 24kN/m and super imposed dead load of 16kN/m. Use M-20 grade of concrete and HYSD steel Fe - 415. Determine tension and compression reinforcement. **(10 Marks)**

b. A T – beam of depth of 450mm has a flange width of 1000mm and depth of 120mm. It is reinforced with 6-20mm ϕ bars on tension side with a cover of 30mm. If M-20 concrete and Fe – 415 steel are used. Calculate moment of Resistance of beam. Take b_w = 300mm. **(10 Marks)**

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Module-3

5 A simply supported RC beam supports a service live load of 5kN/m over a clear span of 4m. Support width is 300mm. Design the beam for flexure and shear. Check the beam depth for control of deflection using Empirical method. Take M_{20} and Fe415 and also sketch the reinforcement details. **(20 Marks)**

OR

6 Design a Rectangular beam 230mm × 600mm over an effective span of 5m. The superimposed load on the beam is 50kN/m. Effective cover to reinforcement is taken as 50mm. Use M_{20} concrete and Fe415 steel. Sketch the reinforcement details of the section. **(20 Marks)**

Module-4

7 a. Distinguish between one way slab and two way slab. **(04 Marks)**

b. Design a two – way RCC slab for a room 6m × 4m supported on wall 230mm corners are held down. Live load 4kN/m^2 , floor finish 1kN/m^2. Adopt M_{20} concrete and Fe415 steel. **(16 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 the flight is to be 1.25m. Allow a live load of 3kN/m^2. Sketch the details of the reinforcement. Use M_{20} 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 a circular column to carry axial load of 1000kN. Use M_{25} and Fe415. Sketch the reinforcement details. **(08 Marks)**

b. Design a rectangular column subjected to an axial factored load of 1800 kN. Take effective length = 3.2m. Use M_{20} concrete and Fe415 steel. Check for minimum eccentricity. **(12 Marks)**

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OR

10 A Rectangular column 450mm × 600mm carries a DL of 800kN and a live load of 1400kN. The SBC of soil is 150kN/m^2. Using M_{20} concrete and Fe415 steel. Design a rectangular footing. Sketch the details. **(20 Marks)**

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