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17CV/CT51

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021 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 IS 456-2000 and SP-16 is permitted.**

Module-1

- 1 a. Explain balanced section, over reinforced section and under reinforced section. (06 Marks)
 b. Derive the expression for limiting steel and find limiting percentage steel for M20 concrete and Fe415 steel. (06 Marks)
 c. A doubly reinforced rectangular beam $250 \times 550\text{mm}$ reinforced with 4-22mm diameter in tension 2-16mm diameter in compression E cover 50mm E span 12m Fe 415 steel. Check the deflection using modification factors. (08 Marks)

OR

- 2 a. Explain working stress method and limit state method of design. (06 Marks)
 b. Explain the philosophy of structural design. (06 Marks)
 c. Derive the expression for stress block parameters of compressive force C and its CG dist \bar{Y} . (08 Marks)

Module-2

- 3 a. A singly reinforced beam $250\text{mm} \times 500\text{mm}$ is reinforced with 4-16mm diameter E-Cover 50mm E span 6m. Determine the central point load that can be applied at mid span adopt M20 concrete Fe 500 steel. (10 Marks)
 b. Find the steel for a rectangular section $300\text{mm} \times 600\text{mm}$ to support a load of 80kN/m E-span 6m E-Cover 50mm adopt M20 concrete Fe 415 steel. (10 Marks)

OR

- 4 a. A doubly reinforced concrete beam $250 \times 450\text{mm}$ is reinforced with 4-20mm diameter in comp 6-20mm diameter in tension. Find ultimate moment take E cover 50mm adopt M20 concrete Fe415 steel. (10 Marks)
 b. A T beam has a flange width 1200mm flange thickness 100mm E depth 600mm web 300mm. Find steel to support ultimate moment 700kN m adopt M20 concrete Fe510 steel. (10 Marks)

Module-3

- 5 Design a beam having clear span 5m supporting a love load 10kN/m for flexure and shear. Apply the check for deflection and bond. Adopt M20 concrete Fe415 steel. (20 Marks)

OR

- 6 A rectangular beam $250\text{mm} \times 500\text{mm}$ to support a load 40kN/m including self wt (working load) E-span 5m E-cover 50mm. Design the beam for flexure and shear and apply check for deflection and bond. (20 Marks)

**Module-4**

- 7 Design a two way slab for a room $6\text{m} \times 4\text{m}$ wall thickness 230mm. All edges discontinuous and corners are held down live load 4kN/m^2 floor finish 1kN/m^2 thickness of slab 150mm adopt M20 concrete Fe415 steel. (20 Marks)

OR

- 8 An open well stair case is to be provided for a stair hall $3.25\text{m} \times 3.25\text{m}$. The size of open well at centre $1.25\text{m} \times 1.25\text{m}$ Floor height 3.6m size of landing at each corner is $1\text{m} \times 1\text{m}$ thickness of stair wall 230mm. The stair slab is embedded into wall by 200mm live load 3kN/m^2 design the stair. (20 Marks)

Module-5

- 9 a. An axially loaded RCC column un supported length 2.75m has to carry an axial load 2000kN design a square section column. (12 Marks)
b. Design a column using SP-16 having a section $300\text{mm} \times 400\text{mm}$ subjected to ultimate load 1200kN ultimate moment $M_u = 200\text{kN m}$. Take effective cover 50mm. Assume steel on two sides only. (08 Marks)

OR

- 10 A square column 400mm sides carries a load of 900kN. Design footing SBC of soil 100kN/m^2 adopt M20 concrete Fe415 steel. Apply the check for one way shear and two way shear and bond. Assume depth of edges 300mm (Isolated footings). (20 Marks)

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