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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 250×550 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 mm \times 500 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 mm \times 600 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 250×450 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 mm \times 500 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 unsupported 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)

