

Fifth Semester B.E. Degree Examination, Aug./Sept.2020
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 IS456-2000 and SP16 is permitted.*

Module-1

- 1 a. Explain balanced section, under reinforced section, and over reinforced section. (04 Marks)
b. Obtain an expression for stress block parameter compressive force C_u and its position $\bar{y} = 0.42 x_u$ from top. (08 Marks)
c. Obtain an expression for limiting percentage of steel and find limiting steel for M20 concrete and Fe415 steel. (04 Marks)

OR

- 2 a. Explain limit state of deflection and limit state of cracking. (04 Marks)
b. What are the factors and which influence deflection? (04 Marks)
c. Check the deflection requirement for the T beam continuous over 10m span having flange width 1200 mm web width 250mm and effective depth 400mm. Area of tension reinforcement 1500mm^2 area of compression reinforcement 960mm^2 . Adopt Fe415 steel. (08 Marks)

Module-2

- 3 a. A singly reinforced concrete beam 250 mm and 450mm deep up to centre of reinforcement is reinforced with 3-16mm dia effective cover 50mm, Effective span 6m. Determine central point load that can be applied in addition to self weight. Adopt M20 concrete and Fe500 steel. (08 Marks)
b. Find the steel for a rectangular beam $300 \times 700\text{mm}$ E.span 6m supporting a load of 80 kN/m. Adopt M20 concrete and Fe415 steel. (08 Marks)

OR

- 4 a. A doubly reinforced concrete beam having rectangular section $250\text{mm} \times 500\text{mm}$ is reinforced with 2-12 mm dia in compression 4-20 mm dia in tension. Effective cover 40 mm, Effective span 5 m. Find M_u . Adopt M20 concrete and Fe415 steel. (08 Marks)
b. A T beam having flange $1200\text{mm} \times 100\text{mm}$ web width 300 mm E.depth 550 mm, Area of tension steel 2280mm^2 . Find M_u . Adopt M20 concrete and Fe 500 steel. (08 Marks)

Module-3

- 5 Design a singly reinforced beam having effective span 7m to carry a live load of 20 kN/m for flexure and shear. Adopt M20 concrete and Fe415 steel. Also check the design for deflection and bond. (16 Marks)

OR

- 6 A hall $6\text{m} \times 16\text{m}$ supported by beam spaced 4m c/c slab thickness 120mm. Supporting a live load 4 kN/m^2 and finishing 1 kN/m^2 . Design interior T beam. Adopt M20 concrete and Fe415 steel. Assume bearing 500 mm. Overall depth limited to 450 mm. Take Effective cover 40mm. (16 Marks)

Module-4

- 7 Design a slab over a room $5.5\text{m} \times 4\text{m}$. Supporting a live load 4 kN/m^2 . Floor finishing 1.0 kN/m^2 . Design the slab if edges are restrained. Adopted M15 concrete and Fe415 steel. (16 Marks)

OR

- 8 The main stair of an office building has to be located in a stair case measuring $3.5\text{m} \times 5.5\text{m}$. Distance between the floor 3.75m . Design the stair. Live load 3 kN/m^2 . Adopt M20 concrete and Fe415 steel. (16 Marks)

Module-5

- 9 a. Design a column to support an ultimate load 1800 kN . Effective length of column 1.85m adopt M20 concrete Fe415 steel. (08 Marks)
b. A column $300 \times 500\text{ mm}$ supporting an ultimate load 1000 kN . $M_u = 25\text{ kNm}$. Find steel Adopt M20 concrete, Fe415 steel. Take cover 50mm . (08 Marks)

OR

- 10 Design a flat square footing to carry a column load 1000 kN column size $400 \times 400\text{mm}$ SBC of soil 100 kN/m^2 . Adopt M20 concrete, Fe415 steel. Show by calculation one way shear check, two way shear bond check and transfer of load at column base. (16 Marks)