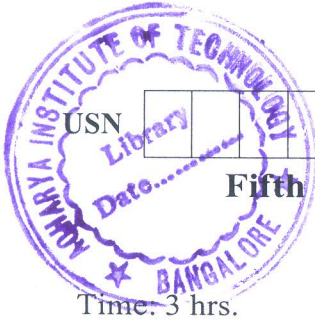


# CBCS SCHEME



15CV/CT51

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  $1500\text{mm}^2$  area of compression reinforcement  $960\text{mm}^2$ . 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  $2280\text{mm}^2$ . 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  $4\text{ kN/m}^2$  and finishing  $1\text{ kN/m}^2$ . 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  $4\text{ kN/m}^2$ . Floor finishing  $1.0\text{ kN/m}^2$ . 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  $3.75\text{m}$ . Design the stair. Live load  $3\text{ kN/m}^2$ . Adopt M20 concrete and Fe415 steel. (16 Marks)

**Module-5**

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

OR

- 10 Design a flat square footing to carry a column load  $1000\text{ kN}$  column size  $400 \times 400\text{mm}$  SBC of soil  $100\text{ kN/m}^2$ . 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)

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