

# CBCS SCHEME

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15CV/CT51

## Fifth Semester B.E. Degree Examination, June/July 2023 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 Code IS465 : 2000 and SP – 16 is permitted.

### Module-1

- 1 a. Explain : i) Characteristic load ii) Characteristic strength iii) Partial safety factor. (06 Marks)  
b. What is stress block? Derive from the fundamentals the expressions for the area of stress block  $0.36 f_{ck} b x_u$  and depth of centre of compressive force from the extreme fibre in compression  $0.42 x_u$ . (10 Marks)

**OR**

- 2 a. Explain : i) Developmental length of bars ii) Short term deflection iii) Long term deflection. (06 Marks)  
b. A rectangular simply supported beam of span 5 m is  $300 \times 650$  mm in cross section and is reinforced with 3 bars of 20 mm on tension side at an effective cover of 50 mm. Determine the short deflection due to an imposed working load of 20 kN/m excluding self weight. Assume grade of concrete M20 and steel as Fe415. (10 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  $300 \times 700$  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 A rectangular beam is to be simply supported on supports of 300mm width. The clear span of the beam is 6m. The beam is to have width of 230mm. The characteristic superimposed load is 12kN/m. Using M<sub>20</sub> and Fe500 steel, design the beam and sketch details of reinforcement. (16 Marks)

**OR**

- 6 Design a rectangular beam of section 300mm and 500mm over all. Effective span 6m and effective cover for reinforcement should be kept as 50mm. Superimposed load on the beam is 40kN/m. Use M<sub>20</sub> concrete and Fe415 steel. Sketch details of reinforcement. (16 Marks)

1 of 2

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-4**

- 7 Design a continuous RC slab for a class room 7m wide and 14 m long. The roof is to be supported on RCC beams spaced at 3.5 m intervals. The width of beam should be kept 230 mm. The super imposed load is  $3 \text{ kN/m}^2$  and furnishing load expected is  $1 \text{ kN/m}^2$ . Use M20 concrete and Fe415 steel. (16 Marks)

**OR**

- 8 Design a dog legged stairs for an office building in a room measuring  $2.8 \text{ m} \times 5.8 \text{ m}$  clear. Vertical distance between the floor is 3.6m. Width of flight is to be 1.25 m. Allow a live load of  $3 \text{ kN/m}^2$ . Sketch the details of reinforcement. Use M20 concrete and Fe 415 steel. Assume the stairs are supported on 230 mm walls at the end of outer edges of landing slabs. (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  $300 \times 500$  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  $100 \text{ kN/m}^2$ . 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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