



CBCS SCHEME

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15CV51

Fifth Semester B.E. Degree Examination, July/August 2021 Design of RC Structural Elements

Time: 3 hrs.

Max. Marks: 80

Note: 1. Answer any FIVE full questions.

2. Use of IS456-2000 and SP(16) are permitted.

- 1 a. Write the difference between working stress method and limit state method. (06 Marks)
b. Derive an expression for area of stress block $- 0.36f_{ck}x_u$ and depth of centre of compressive force from the extreme fibre in compression $0.42 x_u$. (10 Marks)
- 2 a. What are the factors influences short term and long term deflection? (06 Marks)
b. Derive an expression of resistance of moment for a balanced section in terms of F_y and p . (10 Marks)
- 3 a. What are the differences between singly reinforced and doubly reinforced beam. (06 Marks)
b. Determine the moment of resistance (flexural). For the rectangular beam of size 250×450 mm consist of 4 bars of $18 \text{ mm}\phi$ in tension zone. The beam is simply supported over a span of 5 m. Also determine the uniformly distributed load (UDL) which the beam can carry. Use M-20 concrete and Fe-415 steel. Assume clear cover is 40 mm. (10 Marks)
- 4 a. Determine moment of resistance for a cantilever beam 300×400 mm consist of 2 bars of $18 \text{ mm}\phi$ in bottom and 4 bars of $18 \text{ mm}\phi$ in top. Use M20 concrete and Fe415 steel. (06 Marks)
b. Determine the moment of resistance of a T beam. The effective width of the flange is 2500 mm, depth of flange (D_f) 150 mm, width of the rib (B_w) is 300 mm and effective depth (d_f) is 800 mm. F_{ck} is 20 N/mm^2 , $F_y = 415 \text{ N/mm}^2$. Take area of steel is 6000 mm^2 . (10 Marks)
- 5 Design a simply supported rectangular beam of clear span 5 m, supported on 230 mm thick wall. It is also subjected to an uniformly distributed load (UDL) 25 kN/m along with 10 kN point load at midspan. Use M20 concrete and Fe-415 steel. Design the beam for flexural and shear and also sketch the reinforcement details. (16 Marks)
- 6 A T-beam slab floor of an office comprises a slab of 150 mm thick spanning between ribs or webs of 250 mm wide spread at 3.2 m centre to centre. Clear span of beam is 7.7 m. The beam is 600 mm deep including slab and simply supported over a walls of 300 mm wide. Live load on floors 4 kN/m^2 , floor and ceiling finishing is 0.75 kN/m^2 . The beam also supports a partition wall which transmit a load of 12 kN/m. Design one of the intermediate beam for flexure and shear. Two main bars are to be bent near the support. Assume effective cover is 50 mm. (16 Marks)
- 7 Design a rectangular slab $4 \text{ m} \times 6 \text{ m}$ continuous over two adjacent edges to support a live load of 3 kN/m^2 . Characteristic strength of concrete and steel is 20 and 415 N/mm^2 . Use limit state method of design and sketch the reinforcement details. (16 Marks)

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.

- 8 Design a open wall staircase for an residential building of a room size $4\text{m} \times 5.5\text{m}$. Take riser height 150 mm, tread 250 mm, floor to floor height is 3.6 m width of the stair is 1.5 m. Use M25 concrete and Fe500 steel. Also sketch the reinforcement details. (16 Marks)
- 9 Design a rectangular column 3.5 m long restrained in position and direction at both the ends to carry an axial load of 2000 kN. Use M25 concrete and Fe415 steel. Also draw the reinforcement pattern. (16 Marks)
- 10 Design a square footing for a square column of size $450 \times 450\text{mm}$ carrying a service load of 2000 kN. Take Safe Bearing Capacity of soil (SBC) is 300 kN/m^2 at a depth 1.5 m below ground level. Adopt M20 concrete and Fe415 steel. (16 Marks)

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