



CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

21CV53

Fifth Semester B.E./B.Tech. Degree Examination, June/July 2026

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. Missing Data may be assumed suitably.

3. Use of IS : 456 : 2000 and SP 16 are permitted.

Module-1

1 a. Explain working stress method and limit state method. (08 Marks)

b. Explain :

- i) Characteristic Strength
- ii) Characteristic Load
- iii) Practical safety factor

(06 Marks)

c. Explain :

- i) Under Reinforced section
- ii) Over reinforced section
- iii) Balanced section

(06 Marks)

OR

2 A simply supported beam of rectangular section 250 mm wide by 450 mm overall depth is used over an effective span of 4 m. The beam is reinforced with 3 bars of 20 mm dia, Fe415 bars at an effective depth of 400 mm. Two hanger bars of 10 mm diameter are provided. The self weight of the beam is 4 kN/m. Service load is 10 kN/m. Use M20 grade concrete. Compute :

- i) Short term deflection
- ii) Long term deflection

(20 Marks)

Module-2

3 a. Enumerate at least three situations in which a doubly reinforced beam becomes necessary. (05 Marks)

b. An RCC beam (300 × 600)mm having 4-16 ϕ as compression steel and 6-20 ϕ has tension steel. The bars are located at 50 mm from respective edges. It is supported on a span of 9 m. Use M₂₀ mix and Fe500 steel. Find super imposed load. (15 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.

OR

- 4 Calculate the moment of Resistance. Assuming M_{20} Mix and Fe415 grade steel.

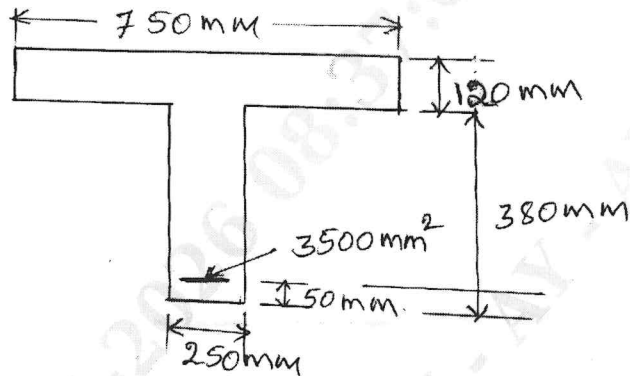


Fig Q4

(20 Marks)

Module-3

- 5 Design a simply supported rectangular beam to carry a live load of 20 kN/m. The span of the beam is 4m resting on 300 mm thick wall. The size of the beam restricted to (200 × 400) mm. Use M_{20} Mix and Fe 415 grade steel. Sketch the reinforcement details.

(20 Marks)

OR

- 6 A floor of a hall measures (15m × 6m) the beams are spaced at 3m c/c. The slab thickness is 120 mm. The floor slab carries a live load of 5kN/m². Design an intermediate T-beam using M_{20} concrete and Fe 415 grade steel and sketch the details of reinforcement.

(20 Marks)

Module-4

- 7 Design a one way continuous slab having 4 equal spans of 3 m each for a factored imposed load of 5kN/m². Use M_{20} concrete and Fe 415 steel.

(20 Marks)

OR

- 8 Design dog legged staircase for a stair hall (4.75 × 3.1) m. Take rise and steps as 150 mm and 250 mm respectively. Width of stairs 1.5 m. Take live load 5 kN/m² and finishes 0.75 kN/m². Use M_{20} concrete and Fe 415 steel. Draw a neat sketch showing the details of reinforcement.

(20 Marks)

Module-5

- 9 Design a short axially loaded circular column to carry a factored load of 1500 kN using M_{20} concrete and Fe 415 steel made. Sketch the reinforcement details. If factored moment of 150 kN-m is added on to this column what percentage increases in steel area is required?

(20 Marks)

OR

- 10 Design a footing for a column carrying an axial load of 800 kN. The SBC of soil as 200 kN/m². Use M_{20} mix and Fe 415 steel. The column has (500 × 500) mm in cross section.

(20 Marks)
