Reg. No. : | E | N | G | G | T | R | E | E | . | C | O | M |

Question Paper Code : 50540

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2024.

Fifth Semester

Civil Engineering

CE 3501 — DESIGN OF REINFORCED CONCRETE STRUCTURAL ELEMENTS

(Regulations 2021)

Time : Three hours Maximum : 100 marks

(Use of IS 456 and SPC16, SP34, Design charts are Permitted)

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Recall any two assumptions of working stress method.
2. Determine the modular ratio of M 25 grade concrete.
3. List four different cases in Flanged beam.
4. Highlight the types of reinforcement used to resist shear.
5. Recall the reason for provision of corner reinforcements in a two way slab.
6. Distinguish between one way shear and punching shear in flat slab.
7. Define slenderness ratio. Classify the columns based on slenderness ratio.
8. Write a short note on the Axially loaded column.
9. Mention the situation at when trapezoidal combined footings are provided.
10. List the assumptions made in combined footing.

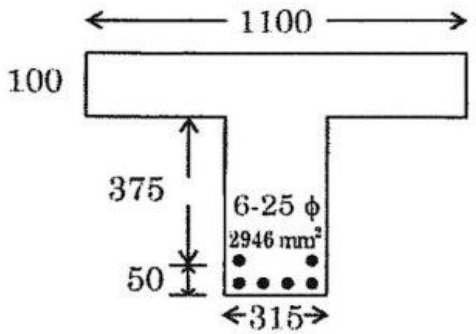
PART B — (5 × 13 = 65 marks)

11. (a) Explain the concept of elastic method and ultimate load method. Write the advantages of limit state method over other methods.

Or

(b) A reinforced concrete beam is supported on two walls 250 mm thick, spaced at a clear distance of 6 m. The beam carries a super-imposed load of 9.8 kN/m. Design the beam using M20 concrete and HYSD bars of Fe 415 grade.

12. (a) Determine the MOR of flanged beam. The area of the steel in tension zone is 6 numbers of 25 mm diameter bars. Use M20 and Fe415.

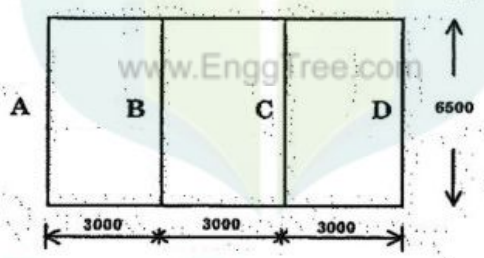


All dimension are in mm

Or

(b) Design a flanged beam with bf = 1000 mm, Df = 100 mm, bw = 300 mm subjected to a live load of 4 kN/m². Use M30 and Fe500.

13. (a) Design the one-way continuous slab subjected to uniformly distributed imposed loads of 5 kN/m² using M 20 and Fe 415. The load of floor finish is 1 kN/m². The span dimensions shown in the following diagram are effective spans. The width of beams at the support = 300 mm.



All dimension are in mm

Or

(b) Design one of the flights of a dog legged stairs spanning between landing beams using the following data. Type of staircase : dog legged with waist slab, treads and risers number of steps in the flight = 10 rise R=150 mm Tread T = 300 mm. Width of landing beams = 300 mm. Use M20 grade concrete and Fe 415 steel.

14. (a) Design the reinforcement in a column of size 400 mm × 600 mm subjected to an axial load of 2000 kN under service dead load and live load. The column has an unsupported length of 4.0 M and effectively held in position and restrained against rotation in both ends. Use M 25 concrete and Fe 415 steel.

Or

(b) Design a square or circular column to carry a working load of 980 kN. the grades of concrete and steel are M 20 and Fe 415 respectively. Assume that the column is short.

15. (a) Explain the types of shallow foundation with neat sketches.

Or

(b) Two columns having cross-section of 250 × 250 mm and 300 × 300 mm are loaded with 300 kN and 500 kN respectively. The c/c distance between the columns is 4 m and the bearing capacity of soil is 100 kN/m². Design a rectangular combined footing without a beam.

PART C — (1 × 15 = 15 marks)

16. (a) Calculate load carrying capacity of column 300 mm × 450 mm in size reinforced with 4 number of 16 mm diameter bars and 4 number of 12 mm diameter bars. Use M20 and Fe45 steel.

Or

(b) Design a RCC square footing for a column 400 mm × 400 mm to carry an axial load of 1200 kN. Take SBC of soil as 200 kN/m² and density of soil as 18 kN/m³. Use M20 concrete and Fe 415 steel. Check for punching shear and one way shear need not be given.