

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note: Attempt five questions in all, select one question each from section A, B, C, D. Section E (Question-9) is compulsory.

SECTION A

1. (a) State the significance of neutral axis in RCC beams and derive the formula for depth of neutral axis. (4)
- (b) Explain in detail the philosophy of Limit State Method. How does it overcome the limitations of the Working Stress Method? (8)

OR

2. (a) Explain how under reinforced, over reinforced and balanced sections are different from each other. (4)
- (b) Write short notes on:
(i) Partial safety factors for materials and loads
(ii) Stress-strain curve of concrete and steel

SECTION B

3. (a) Explain briefly the procedure for the design of shear reinforcement. (4)

- (b) Design a verandah slab to cover an effective span of 3m for concrete grade M20 and HYSD (Fe415) bars. It carries a super imposed load of 5 kN/m including finishes. (8)

OR

4. (a) What do you understand by development length? Sketch the standard hook for 90° bend. (4)
- (b) Explain the design procedure involved in design of one-way slab including all checks. (8)

SECTION C

5. (a) State the slenderness ratio limits for short and long columns. (4)
- (b) Write a detailed note on SP-16 design aids for column design with examples. (8)

OR

6. (a) What are the different types of column failures? (4)
- (b) Design the reinforcement in a column of size 400 mm x 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 is effectively held in position and restrained against rotation in both ends. Use M25 concrete and Fe 415 steel. (8)

SECTION D

7. (a) Classify RCC staircases with neat sketches. (4)
- (b) Explain step-by-step the load calculations in staircases with an example. (8)

OR

8. (a) State the conditions for safe bearing capacity of soil in footing design. (4)

- (b) Classify footings. Write IS code provisions for isolated column footings. (8)

SECTION E (Compulsory)

9. (a) Define characteristic compressive strength and give its significance. (2)
- (b) Explain doubly reinforcement beam. (2)
- (c) Write the condition for a slab to be designed as two-way. (2)
- (d) Explain effective length of the column for different end conditions. (2)
- (e) State the minimum eccentricity to be considered in column design. (2)
- (f) What is the effective span of a staircase flight? (2)