Register No.: ..... Name: .....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIFTH SEMESTER B.TECH DEGREE EXAMINATION (S), FEBRUARY 2024
CIVIL ENGINEERING
(2020 SCHEME)

Course Code: **20CET303**

Course Name: **Design of Concrete Structures**

Max. Marks: **100** **Duration: 3 Hours**

Use of IS 456, SP16, SP 34, IS 875 Part 1, 2, 3 , 5, IS 1893& IS 13920 are permitted

PART A

(Answer all questions. Each question carries 3 marks)

1. Compare with suitable sketches, under reinforced and over reinforced section in limit state design of RC structures.
2. Derive the limiting values of depth of neutral axis for different grades of steel.
3. Enumerate the situations in which a doubly reinforced section become necessary.
4. Explain the term development length and explain its significance in RC design. Obtain the expression for it.
5. Explain the IS code recommendations for the provision of torsion reinforcement in two way slabs.
6. Enumerate the different types of staircases based on its geometrical shapes.
7. Explain the function of transverse ties in a reinforced concrete column?
8. Distinguish between columns subjected to axial load and uniaxial bending and axial load and biaxial bending.
9. Explain at what situations a combined footing is recommended.
10. Enlist the objectives of earthquake-resistant design of reinforced concrete Structures.

PART B

(Answer one full question from each module, each question carries 14marks)

MODULE I

11. Design and detail an RC rectangular section subjected to an UDL of 15 kN/m over the entire span. Clear span is 5m. The beam is supported on masonry walls, 230 mm thick on both sides. Assume moderate exposure conditions. Use M25 grade concrete and Fe 415 grade steel. (14)

OR

12. a) Enumerate the reasons why steel is used as reinforcement. (3)

    b) A rectangular reinforced concrete section having a breadth of (11)

350mm is reinforced with 2 bars of 30mm diameter and 2 bars of 25mm diameter at an effective depth of 750 mm. Adopting M20 grade concrete and Fe 415 steel, determine the moment of resistance of the section. Also determine the flexural capacity of the beam.

MODULE II

13. Design a simply supported rectangular beam 250 mm × 600 mm over an effective span of 5 m. The superimposed load on the beam is 60 kN/m. Effective cover to reinforcement is taken as 50 mm. Use M25 concrete and Fe 500 steel. (14)

OR

14. An RCC beam 250 mm × 400 mm (effective) is carrying a uniformly distributed load of 16kN/m. The beam is reinforced with 4 bars of 22 mm diameter. The clear span of the beam is 4.2 m. Design the shear reinforcement. Use M 20 concrete and Fe 415 steel. (14)

MODULE III

15. Design a dog legged staircase in a room of an office building measuring 3 m × 6 m (clear dimension). The floor to floor height is 3.5 m. The building is a public building liable to overcrowding. Stairs are supported on brick walls 230 mm thick at the ends of landing. Use M25 grade concrete and Fe 500 steel. (14)

OR

16. Design and detail a simply supported slab for a room of interior dimension 5 m × 4 m subjected to an imposed load of 3 kN/m^2. Thickness of supporting wall is 230 mm. Use M20 concrete and Fe 415 grade steel (14)

MODULE IV

17. a) Classify the columns separately based on loadings and slenderness ratios. (4)

    b) Design a circular column to carry an axial load of 1000 kN. Use M20 concrete and Fe 415 steel. Draw a longitudinal section and a cross section showing the reinforcement. (10)

OR

18. Verify the adequacy of the short column of dimensions 300 mm x 500mm for the following conditions. (14)
Pu = 1500 kN, Mux = 125 kNm, Muy = 75 kNm.
Use M25 grade concrete and Fe 500 steel.

MODULE V

19. A beam of width 400 mm and depth 750 mm is reinforced with 3 bars of 40 mm diameter at a clear cover of 40 mm. Calculate the crack width when the section is subjected to a bending moment of 490 kNm at the (14)

following points.
a. On the side of the beam 300 mm below neutral axis
b. Mid way between bars on the tension face
c. At the bottom corner
d. On the tension face directly under the reinforcement bar

OR

20. Design a rectangular footing for an axially loaded column of 450 mm × 450 mm size. Load on column is 800kN. The safe bearing capacity of soil is 190kN/m^2. Use M25 concrete and Fe500 steel. (14)

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