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

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIFTH SEMESTER B.TECH DEGREE EXAMINATION (S), FEBRUARY 2023

CIVIL ENGINEERING

(2020 SCHEME)

Course Code: **20CET303**

Course Name: **Design of Concrete Structures**

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

PART A

(Answer all questions. Each question carries 3 marks)

1. Distinguish between balanced, under reinforced and over reinforced concrete sections.
2. List the assumptions of limit state of collapse by flexure.
3. What are the different forms of shear reinforcement.
4. Derive expression for moment of resistance of a doubly reinforced rectangular beam section.
5. Explain One-way and Two-way action of slabs
6. Explain the concepts of tread-riser type stairs and draw the typical detailing.
7. Explain long column and short column.
8. Draw three columns with different support conditions and mark its effective length.
9. Explain the design principles of rectangular footings.
10. Explain the importance of ductility in seismic design.

PART B

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

MODULE I

11. a) Determine the central concentrated load that can be carried by a simply supported singly reinforced beam of 300 mm x 500 mm reinforced with 4 bars of 20 mm diameter with an effective cover of 50mm. Effective span of beam is 5 m. Use M25 concrete and Fe415 steel. (10)

    b) Explain the terms Characteristic strength and Characteristic load. (4)

OR

12. a) A rectangular beam 250mm wide and effective depth 450 mm has (10)

4 bars of 20mm diameter. Find the moment of resistance of the section if M20 concrete and Fe 415 grade steel are used. As per IS 456:2000 find the limiting moment of resistance also.

b) Write one advantage and one disadvantage of an under reinforced section (4)

MODULE II

13. a) Design the stirrups of a beam section of width 250 mm and effective depth 450 mm. The factored shear force is 120 kN and the percentage of tensile reinforcement is 0.5. Use M20 concrete and Fe 415 steel. (10)

b) Explain how the longitudinal reinforcement bent up nearer to the supports contribute to the shear resistance of RC beams? (4)

OR

14. a) An isolated simply supported T beam has a flange width of 2400 mm and flange thickness of 120mm.The span of the beam is 3.6m. The effective depth of the beam is 580 mm and its width of the web is 300 mm. It is reinforced with 8 numbers 20mm diameter bars of 415 grade. Determine the Moment of Resistance of the section. Use M20 concrete. (14)

MODULE III

15. a) Design and detail a simply supported RCC slab 4m x 10m. Assume a live load of 4kN/m^2. The slab is supported with 230 mm thick walls around. Use M20 concrete and Fe415 grade steel. (10)

b) Briefly explain the load distribution in dog legged stair case (4)

OR

16. a) Design a slab 3.5 m x 4 m clear in size supported on 250 mm thick walls on all four sides, and corners not held down. The live load on slab 2 kN/m^2. Use M 20 concrete and Fe 415 steel. Draw all the detailing required for the slab. (10)

b) Explain the bending action of one way and two way slabs (4)

MODULE IV

17. a) Design a reinforced concrete column to carry an axial load of 1600 kN. Use M20 concrete and Fe415 steel. The column has unsupported length of 3m and is effectively held in position at both the ends, but not restrained against rotation. (10)

b) Differentiate between short columns and long columns in RC construction (4)

OR

18. a) Design a short circular column of effective length 3.3m to carry an axial load of 1200kN. Provide helical reinforcement as transverse reinforcement. Use M25 concrete and Fe415 steel. (10)

b) Why does the code require all columns to able to resist minimum eccentricity of loading? (4)

MODULE V

19. a) What are the objectives of earthquake-resistant design of reinforced concrete structures? What is strong column weak beam concept in earthquake resistant design? (10)

b) Explain at what situations a combined footing is recommended. (4)

OR

20. a) Design a footing for a 350 mm x 350 mm column to carry a load of 120 kN with foundation resting on a soil of SBC 125 kN/m^2. Assume M20 concrete and Fe415 steel. (14)

****