ANURAG Engineering College
(An Autonomous Institution)
III B.Tech I Semester Regular/Supple Examinations, Dec–2023/Jan-2024
STRUCTURAL ENGINEERING – I (DRCS)
(CIVIL ENGINEERING)

Time: 3 Hours   **Max. Marks: 75**

Section – A (Short Answer type questions)   (25 Marks)
Answer All Questions

		Course Outcome	B.T Level	Marks
1.	Contrast between working stress and ultimate load method.	CO1	L2	2M
2.	Write the values of partial safety factors for concrete, reinforcement and loads.	CO1	L1	3M
3.	Recall the principle of limit state analysis.	CO2	L1	2M
4.	Interpret the importance of development length.	CO2	L2	3M
5.	What are the methods for determining deflection and cracking?	CO3	L1	2M
6.	Relate the principles of staircases.	CO3	L1	3M
7.	Compare axial and uniaxial bending.	CO4	L2	2M
8.	Illustrate the interaction diagram.	CO4	L2	3M
9.	List the types of footings.	CO5	L1	2M
10.	Write a short note on combined footing.	CO5	L1	3M

Section B (Essay Questions)
Answer all questions, each question carries equal marks.   (5 X 10M = 50M)

11. A)	Illustrate the stress strain curve for concrete and steel and explain them in detail.		CO1	L2	10M
	OR				
B)	A doubly reinforced beam of size 230 mm x 500 mm effective is subjected to a factored moment of 200 kNm. Use M30 concrete and Fe 415		CO1	L3	10M
12. A)	Determine the shear reinforcement in the form of vertical stirrups of diameter 8 mm of a rectangular cross-section of $b \times d = 250 \times 450$ reinforced with 4 number of 20 mm diameter to resist 100 kN shear force. Use M 25 concrete, Fe 415 for main reinforcement and Fe 250 for transverse reinforcement.		CO2	L2	10M
	OR				
B)	Design and detail a simply supported beam of 6 m clear span. The beam is supported on 375 thick wall and loaded with a super-imposed dead weight of 16 kN/m as well as a live load of 12 kN/m. Use M 20 concrete and Fe 250 steel.		CO2	L3	10M
13. A)	Design a Floor slab 7 x 5 m ,clear dimensions supported all four sides by 230 mm thick walls. Slab is subjected to LL = 4kN/m², Floor Finish = 1kN/m². Use M20 concrete and Fe 415 steel.		CO3	L3	10M
	OR				

B)	Design a dog legged stair case for a residential building hall measuring 2.2 m x 4.7 m. The width of the landing is 1m. The distance between floor to floor is 3.3 m. The rise and tread may be taken as 150mm and 270mm respectively. The weight of floor finish is 1 kN/m². The materials used are M20 grade concrete and Fe415 grade steel. Sketch the details of steel. Here flight and the landing slabs spans in the same direction i.e, Flight spans longitudinally.	CO3	L3	10M
14. A)	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 m and effectively held in position and restrained against rotation in both ends. Use M 25 concrete and Fe 415 steel.	CO4	L3	10M

OR

B)	Design a circular column of 400 mm diameter with helical reinforcement subjected to an axial load of 1500 kN under service load and live load. The column has an unsupported length of 3 m effectively held in position at both ends but not restrained against rotation. Use M 30 concrete and Fe 415 steel.	CO4	L3	10M
15. A)	Design an isolated footing for a square column, 400 mm x 400 mm with 12-20 mm diameter longitudinal bars carrying service loads of 1500 kN. The safe bearing capacity of soil is 250 kN/m² at a depth of 1 m below the ground level. Use M 25 and Fe 415.	CO5	L3	10M

OR

B)	Design a combined footing for two columns 500 mm X 500 mm each, 5 m apart carrying a load of 1600 kN. SBC= 200 kN/m². Use M25 and Fe415 steel. Width is restricted to 2.4 m.	CO5	L3	10M

Note: Allow the code book IS 456-2000.