B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV/DEC 2022
Fifth Semester
Civil Engineering
20CEPC503 - DESIGN OF REINFORCED CEMENT CONCRETE STRUCTURES
(Regulations 2020)

(Use of IS:456-2000 and SP(16) permitted. Assume M20 concrete & Fe415 steel for all problems)

Duration: 3 Hours

Max. Marks: 100

PART - A (10 × 2 = 20 Marks)
Answer ALL Questions

		Marks, K-Level, CO
1.	Draw a stress - strain curve for mild steel bars.	2,K2,CO1
2.	Differentiate between design mix & nominal mix.	2,K2,CO1
3.	Write down the expression for shear resistance offered by each type?	2,K2,CO3
4.	Compute the development length of 28 mm diameter steel rods in tension side for Fe415 steel.	2,K2,CO3
5.	What is the purpose of providing distribution reinforcement in RC slab?	2,K2,CO4
6.	Differentiate between one way slab & Two way slab.	2,K2,CO4
7.	Differentiate between Uni-axial & Bi-axial Bending.	2,K2,CO5
8.	According to IS code "all columns should be designed for a minimum eccentricity" - justify the statement.	2,K2,CO5
9.	Define safe bearing capacity.	2,K1,CO6
10.	What are the governing factors to decide the depth of R.C. Footing?	2,K2,CO6

PART - B (5 × 13 = 65 Marks)
Answer ALL Questions

11. a) A Beam of rectangular section of width 225 mm and effective depth 500 mm is simply supported over a span of 5 m is reinforced with four numbers of 20 mm diameter mild steel bars in the tension side. Determine the position of neutral axis and the stresses in the topmost compression fibre of concrete and tension steel, if the beam carries a UDL of 9 kN/m (including self weight) for the entire span. Use WSD.   13,K3,CO1

OR

b) (i) Explain two major limit states.   3,K2,CO1
(ii) Define characteristic strength and design strength of a material.   5,K2,CO1
(iii) What are the assumptions in Limit state design for flexure?   5,K2,CO1

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

11573

12. a) A simply supported beam of 8 m span is reinforced with 6 bars of 25 mm diameter at centre of span and 50 percent of the bars are continued into supports. Check the development length at supports. The beam supports a characteristic load of 50 kN/m. 13,K3,CO3

OR

b) A beam of rectangular section of width 300 mm and an effective depth 550 mm is subjected to an ultimate moment of 15 kN-m, Ultimate shear force of 50 kN & Ultimate twisting moment = 15 kN-m. Design the reinforcement. 13,K3,CO3

13. a) Design a simply supported RC slab for a roof of hall 4 m X 4 m (inside dimensions) with 230 mm walls around. Assume a live load of 4 kN/sq.m and finishes 1 kN/sq.m. 13,K3,CO4

OR

b) Design a Two way slab for an office floor to suite the following data: 13,K3,CO4
Live load = 4 kN/sq.m,
Load due to finishes = 1.5 kN/sq.m,
Size of floor = 4 m X 6 m.
Edge conditions : Two adjacent edges discontinuous.

14. a) Design a axially loaded tied column 400 mm x 400 mm pinned at both ends with an unsupported length of 3 m carry a factored load of 2300 kN. 13,K3,CO5

OR

b) Design a uniaxially eccentrically loaded braced rectangular column for the following data. 13,K3,CO5
Ultimate axial load = 1200 kN,
Ultimate moment in long direction = 280 kN-m,
Unsupported length of the column = 3.4 m,
Effective length in the long direction = 3.2 m,
effective length in the short direction = 2.8 m,
Column section = 360 mm x 540 mm.
Use SP 16.

15. a) A RCC Column 400 x 400 mm supports an axial service load of 1000 kN. The SBC of soil at a site is 200 kN/Sq.m. Design a suitable footing for the column and sketch the reinforcement details. Use M20 concrete & Fe415 steel. 13,K3,CO6

OR

b) A rectangular RCC Column of size 400 mm x 600 mm carrying an axial load of 1800 kN. If the safe bearing capacity of the soil is 150 kN/Sq.m. Design a suitable footing. 13,K3,CO6

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create **11573**

PART - C (1 × 15 = 15 Marks)

16. a) Determine the area of steel required for a T- beam with the following dimensions: 15,K3,CO2
    Depth of slab = 10 mm,
    breadth of flange = 750 mm,
    breadth of web = 250 mm.
    Total depth = 600 mm,
    The beam is subjected to an ultimate moment of resistance of 525 kN-m. Use 16 mm diameter of steel.

    OR

    b) Analyse a T- beam section 250 mm width of web, 1200 mm width of   15,K3,CO2
    flange, 100 mm thickness of flange & 450 mm effective depth. Determine the ultimate moment of resistance for two cases of reinforcements:
    (i) 4 nos of 20 mm diameter,
    (ii) 4 nos of 25 mm diameter.