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Question Paper Code

11931

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2023

Fifth Semester

Civil Engineering

**20CEPC503 - DESIGN OF REINFORCED CEMENT CONCRETE
STRUCTURES**

(Regulations 2020)

(Use of IS 456 - 2000 Plain and Reinforced Concrete - Code of Practice & sp16 Code
Book is Permitted)

Duration: 3 Hours

Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

- | | <i>Marks,
K-Level, CO</i> |
|--|-------------------------------|
| 1. List the factors to be considered for Limit state of collapse and serviceability. | 2,K1,CO1 |
| 2. Define doubly reinforced beams. | 2,K1,CO2 |
| 3. Calculate the development length of 10 mm diameter bars in M25 concrete if the steel is, (a) Mild steel with $f_y = 230 \text{ N/mm}^2$ (b) Tor steel with $f_y = 415 \text{ N/mm}^2$ | 2,K2,CO3 |
| 4. Calculate the equivalent shear on a 500mm deep & 300mm wide beam when subjected to a S.F of 150 KN and torsion 30 KN-m. | 2,K2,CO3 |
| 5. Determine the minimum effective depth to satisfy the vertical deflection limits for a simply supported slab of 10m effective span. | 2,K2,CO4 |
| 6. Write the difference between oneway and two way slab. | 2,K2,CO4 |
| 7. What are the factors that affect behavior of slender columns (long columns)? | 2,K2,CO5 |
| 8. According to IS code "All columns should be designed for minimum eccentricity" – Justify the statement. | 2,K2,CO5 |
| 9. Define one way shear and punching shear for a combined rectangular footing with two rectangular columns with neat sketch. | 2,K1,CO6 |
| 10. Under what circumstances combined footing is provided? | 2,K2,CO6 |

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11. a) Design a rectangular RC beam in flexure when it is simply supported on masonry walls of 300 mm thick and a clear distance of 4.2 m to support a live load of 3kN/m and dead load of 2kN/m in addition to its own weight. M20 grade concrete and Fe-415 HYSD bars are used. Adopt Working stress method. 13,K3,CO1

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

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OR

- b) Determine the position of neutral axis and the moment of resistance for a beam 300 mm wide and 550 mm effective depth. It is reinforced with 4 bars of 16 mm diameter. Use M25 grade of concrete and Fe415 grade of steel. Adopt working stress method. *13,K3,CO1*
12. a) A RC beam 250 mm wide & 550 mm deep RC beam is reinforced with 4 bars of 25 mm diameter. Effective cover is 50 mm. it is provided with 2 legged 8 mm diameter stirrups at a spacing of 150 mm. determine the strength of the section. If the two bars are bent up at 45 degree at a section. What is the shear strength of the section in shear? *13,K2,CO3*

OR

- b) Design a rectangular beam section of 400 mm width and 800 mm overall depth subjected to ultimate values of bending moment of 120kN.m, Shear force of 100kN and Torsion moment of 50kN.m. Adopt effective cover of 50mm both on top and bottom. M25 grade concrete and Fe-415 HYSD bars are used. Adopt Limit state method. *13,K2,CO3*
13. a) The one way slab is simply supported at its ends and the clear span is 3.5 m. The slab is supported on load bearing brick walls 230 mm thick. Live Load is 2.8 kN/m^2 and a dead load of 2 kN/m^2 is acting on the slab. The materials for concrete and steel are M20 and Fe415. Design by LSM. *13,K3,CO4*

OR

- b) Design a two way slab for an office floor of size $3.5\text{m} \times 4.5\text{m}$ with discontinuous and simply supported edges on all the sides with corners prevented from lifting and supporting a service load of 4kN/m^2 . Adopt M20 grade concrete and Fe415 HYSD bars using limit state approach. *13,K3,CO4*
14. a) Design the reinforcement in a circular column of diameter 350mm with helical reinforcement of 8mm diameter to support a factored load of 1400kN. The column has an unsupported length of 3.5m and is braced against side sway. Adopt M20 grade concrete and Fe415 steel bars. *13,K3,CO5*

OR

- b) Design the reinforcement in a column of size $450 \text{ mm} \times 600 \text{ mm}$, subject to an axial load of 2100 kN under service dead and live loads. The effective length of column is 3.0m. Use M 20 concrete and Fe 415 steel. *13,K3,CO5*
15. a) Design a wall footing for 230 mm thick masonry wall which supports a load of 120 KN/m at service state. Data to design the footing is as follows the Safe bearing capacity of soil is 150 KN/m^2 , Angle of repose of soil is 30° and Unit weight of soil = 20 KN/m^3 . *13,K3,CO6*

OR

- b) Design a suitable footing for a R.C. column of size 300 mm × 500mm supporting a factored axial load of 1600kN. Assume safe bearing capacity of soil as 200kN/m². Adopt M20 grade of concrete and Fe415 grade of steel. 13,K3,CO6

PART - C (1 × 15 = 15 Marks)

16. a) What are the different steps involved in the design of flanged beams? 15,K2,CO2

OR

- b) Analyze and Design a T- beam section with a flange width of 1200mm, a flange depth of 100 mm, a web width of 250 mm and an effective depth of 500 mm, which is subjected to a factored moment of 550 kNm. Use M20 and Fe415 to design by LSM. 15,K3,CO2