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Question Paper Code	12396
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B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2023

Fifth Semester

Civil Engineering

20CEPC503 - DESIGN OF REINFORCED CEMENT CONCRETE STRUCTURES

(Use of IS: 456 – 2000 and SP 16 (Charts and Tables) are permitted)

(Use M20 concrete and Fe415 grade steel unless otherwise stated)

(Regulations 2020)

Duration: 3 Hours

Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

- | | <i>Marks,
K-Level, CO</i> |
|---|-------------------------------|
| 1. List out the types of limit state. | <i>2,K1,CO1</i> |
| 2. Under what circumstances doubly reinforced beams are preferred? | <i>2,K2,CO1</i> |
| 3. When shear reinforcement is necessary in RC beams? | <i>2,K2,CO3</i> |
| 4. What is meant by Modular ratio? | <i>2,K1,CO2</i> |
| 5. Differentiate one-way slab and two-way slab. | <i>2,K2,CO4</i> |
| 6. Why it is necessary to provide transverse reinforcement in a one-way slab? | <i>2,K2,CO4</i> |
| 7. What are the functions of transverse reinforcements in columns? | <i>2,K1,CO5</i> |
| 8. Classify the columns based on type of loading. | <i>2,K2,CO5</i> |
| 9. What are the governing factors decide the depth of footing? | <i>2,K1,CO6</i> |
| 10. Under what circumstances combined footing is preferred. | <i>2,K2,CO6</i> |

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11. a) A T-beam has the following data: width of the flange = 750 mm; breadth of beam = 250 mm; effective depth = 500 mm; thickness of flange = 90 mm; applied moment = 130 kNm. Design the T-beam using M20 concrete and Fe415 steel. *13,K3,CO2*
- OR**
- b) Calculate the moment of resistance for following section properties *13,K3,CO2*
Width of flange=1280mm, Depth of flange=100mm, Width of rib=280mm, Effective depth=700mm, Area of steel=5# of 25mm diameter. Use Fe 415 grade steel, M20 Concrete.
12. a) A rectangular beam of width 250 mm and effective depth 500 mm is reinforced with 4 bars of 20 mm diameter. Determine the shear reinforcement required to resist a shear force of 150 kN. Use M30 concrete and Fe415 steel. *13,K3,CO3*

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

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OR

- b) Design a rectangular beam section of width 250 mm and effective depth 500 mm, subjected to Bending moment of 160 kNm, Shear force of 30 kN and Torsional moment of 10 kNm. Use M20 concrete and Fe415 steel. *13,K3,CO3*

13. a) The first floor of a residential building is made of a simply supported RC slab with 300 mm wall all around. The inside clear dimensions of the floor are 4 m x 12 m. Assume a live imposed load of 3 kN/ m² and a tile finish of 1.5 kN/ m². Use M25 concrete and Fe 415 steel. *13,K3,CO4*

OR

- b) Design a two-way slab for an office floor to suit the following data: *13,K3,CO4*
Live load = 4 kN/m²
Load due to finishes = 1.5 kN/m²
Size of floor = 4 m x 6 m
Edge conditions: Two adjacent edges discontinuous
Use M30 concrete and Fe 415 steel.

14. a) Design an axially loaded tied column 450 mm x 450 mm pinned at both ends with an unsupported length of 3.2 m to carry a factored load of 2300 kN. Use M40 concrete and Fe415 steel. *13,K3,CO5*

OR

- b) A column 350 mm x 450 mm has an unsupported length of 3.5 m and fixed at both ends. It is subjected to a factored load of 1000 kN and an ultimate moment of 220 kNm about the major axis. Design the longitudinal reinforcement and lateral ties. Consider M25 grade concrete and Fe415 steel. *13,K3,CO5*

15. a) Design a plain concrete footing for a 300 mm wall carrying 350 kN per meter length. Assume M20 grade concrete and the bearing capacity of soil to be 150 kN/m². *13,K3,CO6*

OR

- b) A solid footing has to transfer a dead load of 150 kN and an imposed load of 450 kN from a square column 400 mm x 400 mm. The safe bearing capacity of the soil is 18 kN/m². Use concrete M20 and steel Fe415. Design the footing. *13,K3,CO6*

PART - C (1 × 15 = 15 Marks)

16. a) (i) Explain two major limit states. *5,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*

OR

- b) Design a rectangular section of reinforced concrete beam having a clear span of 5m which carries a service load of 4kN/m throughout the span. Use M20 grade concrete and Fe415 grade steel. Use limit state method. *15,K3,CO1*