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Name.....

Reg. No.....

FIFTH SEMESTER B.TECH. (ENGINEERING) [14 SCHEME] DEGREE EXAMINATION, NOVEMBER 2016

CE 14 501—STRUCTURAL DESIGN—I

Time : Three Hours

Maximum : 100 Marks

Part A

Answer any **eight** *questions.*
Each question carries 5 *marks.*

1. Describe the stress- strain characteristics of concrete up to failure.
2. What are the main factors influencing the fatigue strength of concrete ?
3. Distinguish between working stress method and limit state method of design.
4. Define characteristic strength and partial safety factor for materials. Why is partial safety factor for material high for concrete than steel ?
5. Distinguish between balanced section, under reinforced section and over reinforced section in limit state method.
6. Explain the term development length and explain its significance in RC design, obtain the expression for it.
7. Explain why and how shear reinforcement is provided in beams.
8. What is meant by stair supported on landings ? Explain the codal provision for the effective span of the stair slab in such cases ?
9. Explain how interaction curves are used in the design of column.
10. Explain the difference in the behaviour of one-way and two-way slabs. Why it is essential to provide corner reinforcement in two way rectangular slabs whose corners are prevented from lifting up ?

(8 × 5 = 40 marks)

Part B

All question carries 15 *marks.*

MODULE I

11. (a) Explain what is meant by grade of concrete. (5 marks)

    (b) What are the different grades of steel available in market ? (5 marks)

    (c) Briefly explain the evolution of different design philosophies on design of RCC sections. (5 marks)

Or

12. (a) What are the IS codal provisions for durability and fire resistance. (5 marks)

(b) Derive expressions for the moment of resistance of singly and doubly reinforced rectangular and flanged beam sections.

(10 marks)

MODULE II

13. Design a simply supported beam to carry a live load of 30kN/m, dead load of 5kN/m in addition to the self weight of the beam. Clear distance between the support is 6 m, thickness of the support 250 mm, maximum overall depth is 600mm. Use M20 mix and Fe 415 grade steel.

Or

14. Determine the ultimate moment of resistance of an isolated beam of T-shaped cross-section having a span of 6 m and cross sectional dimensions are flange width of 1000 mm, flange thickness of 100mm, web width of 250 mm and an effective depth of 520 mm, having tension reinforcement of 6 × 28 mm diameter bars. The materials used are concrete mix of grade M20 and mild steel of grade Fe 250.

MODULE III

15. Design a simply supported slab to cover a room with clear internal dimensions 5 × 4 m supported over 230 mm thick brick walls all around. Assume live load 3kN/m^2 and load from finishes 1kN/m^2. Use M20 concrete and Fe415 steel. Assume that slab corners are not free to lift up. Sketch the reinforcement details. Do all the necessary checks.

Or

16. Design a continuous roof slab for a hall measuring 6 m × 40 m with beams spaced at 4mc/c. Assume a live load of 2kN/m^2. Use M20 concrete and Fe415 steel.

MODULE IV

17. Design a staircase to be provided in a residential building in two straight opposite flights of 1.0 m width connected by a landing for a floor height of 3.3 m. The landing which is 1 m wide spans in the same direction as the stair slab . The rise and tread shall be 150 mm and 270 mm respectively. The weight of finishes 1kN/m^2, live load = 3kN/m^2. M20 concrete and Fe415 steel are to be used.

Or

18. Design a short column subjected to an axial load of 750 kN and a moment of 150 kNm about its major axis. Use M20 concrete and Fe415 steel. Sketch the reinforcement details.

(4 × 15 = 60 marks)