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VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (Civil Engg.) III Year I-Semester Main & Backlog Examinations, December-2017

Reinforced Concrete Design-I

Time: **3** hours Max. Marks: **70**

*Note: Answer **ALL** questions in **Part-A** and any **FIVE** from **Part-B***

Part-A (10 × 2 = 20 Marks)

1. What do you understand by 'Cracked section design'?
2. Which of the two methods, Limit state and Working stress, is Non-deterministic. Explain why?
3. Define the terms 'Characteristic Load' and 'Characteristic Strength' as used in Limit state method.
4. Compute the development length for Fe-500 deformed bars embedded in M-45 concrete, using Limit state method.
5. Outline the concept of 'design for torsion' as envisaged by IS-456.
6. On what parameters does the deflection due to shrinkage in a beam depend?
7. Sketch the typical bending moment contours for one-way and two-way simply supported slabs respectively.
8. Critically examine the applicability of Yield line theory to RC slabs.
9. Find the axial load carrying capacity with zero eccentricity of a short column of 230 mm × 450 mm reinforced with 8 bars of 16 mm diameter. Adopt M-20 and Fe-415.
10. As a designer, what are your options when the checks for two-way shear and load transfer are not satisfied in a footing?

Part-B (5 × 10 = 50 Marks)

11. a) Derive the expression for balanced percentage of steel in a beam, using modular ratio approach. [2]

    b) Using the design constants of working stress method for M-20 concrete and for steels of Fe-250 and Fe-415 grades respectively, check the depth and steel requirements in a beam subjected to a given bending moment 'M' and hence prove that use of mild steel gives overall economy. [8]

12. a) Derive the stress block parameters for limit state of collapse in flexure. [3]

    b) Design the flexural reinforcement in a beam of 230 mm × 450 mm effective dimensions, subjected to a factored bending moment of 150 kN-m. Adopt M-20 concrete and Fe-415 steel. The stress in compression steel may be assumed as 355 MPa. [7]

13. a) Explain the aspects of detailing of shear reinforcement in a beam, as specified in IS-456 and SP-34. [3]

    b) Design the reinforcement in a beam of 300 mm × 600 mm overall dimensions subjected to a factored shear of 125 kN , a factored bending moment of 150 kN-m and a factored twisting moment of 20 kN-m. Effective cover for the reinforcement on both compression and tension sides may be taken as 30 mm. Adopt M-25 and Fe-415 steel. [7]

Contd... 2

14. a) Explain the provisions made by IS-456 for the torsion reinforcement in a two-way simply supported slab panel. [2]

    b) A slab of 4 m × 6 m simply supported on all edges, is of 125 mm thickness and is reinforced with 10 mm dia bars at 150 mm c/c in the shorter direction and 10 mm dia bars at 200 mm c/c in the longer direction . Assuming M-20 concrete and Fe-415 steel, determine the collapse udl for the slab. [8]

15. a) Explain the concept of minimum eccentricity used in the analysis and design of columns subjected to bending. [2]

    b) Design a square footing of uniform depth for a circular column of 300 mm dia carrying an axial factored load of 1800 kN. Adopt M-25 concrete and Fe-415 steel. Assume the safe bearing capacity of underlying soil as 300 kN/m^2. [8]

16. a) Explain the evolution of design philosophies for RC members. [2]

    b) Compute the ultimate moment of resistance of a beam with the following data: Effective width of flange - 1800 mm, Depth of flange - 125 mm, effective depth - 450 mm, width of web - 230 mm, tension reinforcement - 4 bars of 20 mm dia, concrete - M-20, steel - Fe-415. [8]

17. Write short notes on any ***two*** of the following:

    a) Check for cracking in a beam. [5]

    b) Detailing of reinforcement in slabs. [5]

    c) Interaction diagrams for columns. [5]