# ANNA UNIVERSITY - 2007

**B.E/B.TECH DEGREE EXAMINATION**

**STRUCTURAL DESIGN-II**

**(CIVIL ENGINEERING)**

**TIME-3HOUR**
**MARK-100**

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**ANSWER ALL THE QUESTIONS**

**PART A — (10 ´ 2 = 20 MARKS)**

1. Define moment of resistance.

2. What are the three factors must be considered while designing a water retaining structure?

3. Distinguish between characteristic strength and design strength.

4. What are the magnitudes of crack width allowed in concrete structures for various environments?

5. What are the effects of shear in RC beams?

6. Distinguish between flexural bond and anchorage bond.

7. Define Slenderness ratio of column. How columns are classified based on this ratio?

8. Distinguish between braced and unbraced column.

9. Under what circumstances is a trapezoidal shape preferred to a rectangular shape for a two column combined footing?

10. Define cavity wall and shear wall.

**PART B — (5 ´ 16 = 80 MARKS)**

11. (i) What are the advantages of limit state method over other methods?

(ii) Design a RC rectangular beam by working stress method for a simply supported span of 5m and carrying a superimposed load of 20 kN/m inclusive of its self weight. Take width of beam as 300 mm.

12. (a) (i) What are the assumptions made in analysis and design of flexural members for Limit state of collapse?

(ii) Design a T-beam by Limit state approach for a span of 6m simply supported a their ends by 300mm. The beams are spaced at 3.5m centre to centre. The live load on the slab is 3 kN/m2.

(OR)

(b) (i) Write the design procedure for deflection control of beams.

(ii) Design a two way slab of 2m x 3m by Limit state method, simply supported on all four sides. The thickness of wall is 200mm. The corners of the slab are not held down. It has to carry a characteristic live load of 10 kN/m2.

13. (a) (i) What is mean by development length? In what places development length of bars in tension should be checked?

(ii) A T-beam of flange size 700 mm x 120 mm and web size 350 mm x 680 mm is subjected to factored bending moment of 215 kN-m, factored shear of 150 kN and factored torsion of 105 kN-m. Design the reinforcements by using Limit state method. Take cover to centre of steel as 50mm.

(OR)

(b) (i) What is mean by anchorage of steel bars? What are the IS provisions for providing anchorages for shear reinforcement?

(ii) A doubly reinforced simply supported rectangular beam of 250 mm x 450 mm effective size carries a characteristic imposed load of 8 kN/m. The clear span of the beam is 7 m. It is reinforced with 4 numbers of 16mm dia bars in the tension zone and 3 numbers of 16mm dia bars in compression zone throughout its length. Taking partial safety factor as 1.5, design the shear reinforcement.

14. (a) (i) Draw and explain the interaction diagram of columns.

(ii) Design a column of 400 mm x 600 mm size carrying factored load = 1600 kN, factored moment (major axis) = 120 kN-m and factored moment (minor axis) = 90 kN-m. Take d'=60mm.

(OR)

(b) (i) Explain the behaviour of tied column and spiral column subject to axial loading.

(ii) Design a biaxially eccentrically loaded braced rectangular column of size 300 mm x 480 mm subjected to factored axial load of 1000 kN and factored moments of 80 kN-m and 30 kN-m with respect to major and minor axis respectively at the top end. Assume the column is bent in single curvature. Take factored moments with respect to major and minor axis as 110 kN-m and 40 kN-m at the bottom end. The unsupported length of column is 5.8 m and effective length in long and short directions are 5.4m and 4.2m.

15. (a) (i) Explain briefly the load transfer mechanism in two column combined footing.

(ii) Design an isolated footing for a column 300mm x 500 mm reinforced with 6 numbers of 25 mm dia bars subject to a factored axial load of 1000 kN and a factored uniaxial moment of 120 kN-m at the column base. Assume that the moment is reversible. The safe bearing capacity of soil may be taken as 200 kN/m2 at a depth of 1.25 m.

(OR)

(b) (i) Define effective thickness of a wall. How the effective thickness can be taken for solid walls, cavity walls and cross walls.

(ii) Design an interior brick masonry cross wall of a storey building to carry 100 mm thick RCC slab with 3m ceiling height. The wall is unstiffened and it supports 2.65 m wide slab. Take Live load on roof = 1.5 kN/m2. Live load on floor = 2.0 kN/m2.