M.E. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2006.

Elective

Structural Engineering

ST 035 — DESIGN OF FOUNDATION STRUCTURES

(Regulation 2002)

Time : Three hours   Maximum : 100 marks

Use of IS 456, SP 16, IS 2911 and other relevant BIS codes is permitted.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1.   How will you find sample disturbance?

2.   Sketch 'soil profile' and give its use.

3.   Sketch strap footing and mark the components.

4.   What are the advantages of Mat foundation?

5.   Give any two comparison of drilled pier and pile.

6.   Explain how well steining is constructed.

7.   Explain the use of Tension piles and Fender piles.

8.   Define the term frequency and resonance.

9.   What is Damping Factor?

10.   Give the various types of foundation for transmission line towers.

PART B — (5 × 16 = 80 marks)

11. (a) Explain how stability against over turning is checked in tower foundation design. (16)

Or

     (b) Give the general design criteria for design of foundation for towers. (16)

12. (a) Explain the planning aspects of a :

          (i)   Spacing of borings. (8)

          (ii) Depth of borings. (8)

Or

     (b) (i)   What are the advantages and disadvantages of accessible exploration? (8)

          (ii) Write a brief note on the precautions to be taken in transporting undisturbed samples. (8)

13. (a) Determine the drag force on a pile group due to consolidation of clay soil which occurs at a depth of 1.5 m from the butt level. A sand fill having γ = 19.2 kN/m³ overlies this clay layer. The clay layer is fully consolidated prior to sand fill and has γ = 16 kN/m³ and a thickness of 6 m. The square pile group consists of 16 piles, each 35 cm in diameter. Spacing between the piles is 90 cm. (16)

Or

     (b) Proportion a trapezoidal combined footing for the following data :

          Allowable soil pressure :   For DL + reduced LL = 190 kN/m²

                                       For DL + LL = 280 kN/m²

Column loads	Column A	Column B
DL	550 kN	680 kN
LL	420 kN	860 kN

          Distance centre-to centre of columns 5.2 m. Projection beyond column A not to exceed 0.5 m. (16)

(a) A footing 3.2 m × 3.2 m square is loaded with an axial load of 4200 kN and M_x = 2100 kN-m, M_y = 1300 kN-m. The soil has properties of ϕ = 35° and C = 19 kN/m². The footing is located at 2 m depth, the unit weight of soil is 12 kN/m³. The water table is 7.2 m below surface. What is the allowable bearing capacity, if factor of safety is 3, using Hansen's bearing capacity equation and Meyershof's reduction factors. (16)

Or

(b) A bridge pier is supported on two round caissons that is to rest on hard soil at a depth of 32 m below the river bed. The caissons are to carry 28000 kN load. The skin friction of the material above the soil may be assumed as 16 kN/m². Compute the diameter of the caisson and thickness of the plug. (16)

15. (a) (i) How is the I.R.C. method for the analysis of the Lateral stability of a well foundation superior? (8)

(ii) What are the merits and demerits of a Floating Caisson when compared to other types? (8)

Or

(b) The following data refer to a single cylinder reciprocating machine : (16)

Crank radius = 100 mm

Length of connecting rod = 300 mm

Operating speed = 1600 rpm

Weight of reciprocating parts = 50 N

Weight of rotating parts = 10 N

Calculating the maximum unbalanced force generated by the machine.

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