problem,

ilibrium
$t = 0.5$

(12)

(4)

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M.E. DEGREE EXAMINATION, MAY/JUNE 2006.

Elective

Structural Engineering

ST 035 — DESIGN OF FOUNDATION STRUCTURES

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Explain the importance of 'core recovery ratio' in subsoil investigation.

2. Define 'depth factor' correction in relation to the settlement of shallow foundations.

3. Suggest the procedure to construct foundations close to existing structures for heavy loading.

4. Explain the use of slab and beam raft.

5. Explain drag down effects on deep foundations.

6. What are the four principle methods of constructing basements?

7. What are uses of bonded rubber mountings in machine foundation?

8. What are the reasons for inward yielding of anchored excavations?

9. How do the ground anchors derive resistance loads?

10. What are the factors to be considered in the design of tower foundations.

8340

PART B — (5 × 16 = 80 marks)

11. (i) In what factors does the depth and width of footing depend? How are they accounted for? (6)

(ii) How does the detailing of reinforcement differ between a column and a pile? (6)

(iii) Are piled foundations checked for settlements. (4)

12. (a) (i) Explain how the concept of beams on elastic foundation is applied in the structural design of shallow foundation. (4)

(ii) For a floating raft in clay 50 m × 30 m the net loading intensity on the soil produces permissible settlement is found to be 60 kN/m^2. If the raft consists of a dead load of 120 MN and a live load of 84 MN, determine the depth at which the raft can be constructed for full compensation. Take the average unit weight of soil as 15.2 kN/m^3, average cohesion as 21 kN/m^2 and factor of safety = 3. (12)

Or

(b) Design a pile cap for a column 300 mm × 300 mm, supported on three piles. The column is situated at centroid of the pile group. The total load transferred to the column is 600 kN. The piles are at 1.2 m centre to centre. Use M 20 concrete and Fe 415 steel. (16)

13. (a) (i) What are the principal components of a well foundation? (8)

(ii) Discuss the principles in structural design of skeining and bottom plug of a well foundation. (8)

Or

(b) (i) What are the codal provisions for the reinforcement in a well foundation? (8)

(ii) How do the flow characteristics influence the design of the depth of a well foundation? (8)

14. (a) (i) Describe the requirements governing the design of foundations for impact type machines. (8)

(ii) How are the vibrations isolated and insulated in a machine foundation? (8)

Or

(b) (i) Describe one method of determining the natural frequency of a machine foundation soil system. (4)

(ii) Design a foundation for a drop hammer on a soil bed of compact sand for the following data :

Weight of tup = 6 kN

Height of fall of tub = 1.20 m

Weight of anvil = 120 kN

The minimum ratio between the weight of foundation block to the weight of tup is 80. (12)

5. (a) (i) Draw the design pressure diagram for a braced cut due to earth pressure for the following soil layers :

(1) dense sand

(2) loose sand

(3) clay. (3)

(ii) A sheet pile wall, anchored at a point 1.00 m below the top is to support the sides of an excavation 6.00 m deep in a dry sandy soil with $\phi = 35°$ and $\gamma_d = 19\,kN/m^3$. For a factor of safety of 2 on the passive resistance and assuming free earth support, determine the depth of embedment and the force in the tie rods spaced at 2.00 m centre to centre. (13)

Or

(b) (i) How does the stability of a cut affected if the sheetings are driven below the bottom of the cut? (4)

(ii) Design a continuous deadmam to be installed in a sandy deposit at a depth of 0.5 m below ground surface. The anchor rod tension is 75 kN/m. The factor of safety against anchor resistance failure is 1.5. The unit weight of the soil is 18.7 kN/m^3. The angle of shearing resistance is 32° and cohesion is zero. (12)
