[Total No. of Questions - 9] [Total No. of Printed Pages - 4] (2125)

15165

B. Tech 5th Semester Examination

Geotechnical Engineering-II (NS)

CE-313

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions in all, select one question from each section A, B, C and D. Section E is compulsory.

SECTION - A

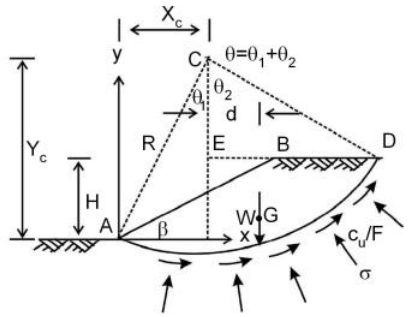
1. (a) A retaining wall has a vertical back and is 7.32 m high. The soil is sandy loam of unit weight 17.3 kN/m^3. It has cohesion of 12 kPa and ϕ = 20°. Neglecting wall friction, determine the active thrust on the wall. The upper surface of the fill is horizontal. Also find the resultant thrust on the wall if the drains are blocked and water builds up behind the wall until the water table reaches a height of 2.75 m above the bottom of the wall. (10)

   (b) Describe Culmann's graphical method of finding earth pressure and explain the classical theory of earth pressure on which this procedure is based. Explain how surcharge will affect earth pressure in active and passive states. (10)

2. (a) Describe a suitable method of stability analysis of slopes in (i) purely saturated cohesive soil (ii) cohesionless sand. (10)

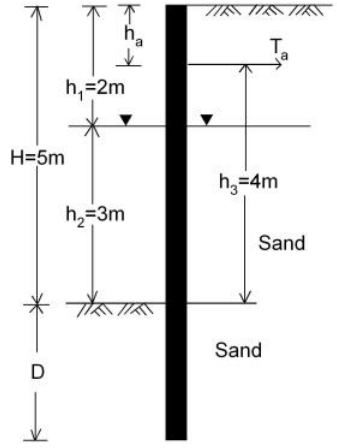
   (b) Determine the factor of safety for a 1 vertical to 2 horizontal slope 5 m high using a trial toe circle for which X_c = 4.5 m and Y_c = 8 m as shown in figure below. The cross-sectional area of the sliding mass is 40.22 m^2 and its centroid is located 2.69 m to the right of the centre of the trial circle. The soil properties are c_u = 18 kPa, ϕ_u= 0 and γ = 18 kN/m^3. (10)

[P.T.O.]



SECTION - B

3. Determine the depth of embedment and the force in the tie rod of the anchored bulkhead shown in figure below. The backfill above and below the dredge line is sand, having the following properties G = 2.67, γsat = 18 kN/m^3, γd = 13 kN/m^3 and ϕ = 30°. Solve the problem by the free-earth support method. Assume the backfill above the water table remains dry. (20)



4. (a) What is the function of a 'foundation'? What are the considerations in the choice of the foundation type? How is the depth of the foundation determined? (10)

(b) What are the commonly used methods of soil exploration? Explain any one method in detail. (10)

SECTION - C

5. A strip footing of width 3 m is founded at a depth of 2 m below the ground surface in a (c - ϕ) soil having a cohesion c = 30 kPa and angle of shearing resistance θ = 35°. The water table is at a depth of 5 m below ground level. The moist weight of soil above the water table is 17.25 kN/m^3. Determine

(a) the ultimate bearing capacity of the soil.

(b) the net bearing capacity.

(c) the net allowable bearing pressure and the load/m for a factor of safety of 3. Use the general shear failure theory of Terzaghi.

(d) If the soil fails by local shear failure, determine the net safe bearing pressure. All the other data given above remain the same.

If the water table rises to the ground level, determine the net safe bearing pressure of the footing. All the other data given above remain the same. Assume the saturated unit weight of the soil γ_{sat}= 18.5 kN/m^3. (20)

6. (a) Explain the basic difference in the bearing capacity computation of shallow and deep foundations. How is skin frictasion and point resistance of a pile computed? (10)

(b) A group of 16 piles with 4 piles in a row was driven into soft clay. The diameter and length of the pile is 300 mm and 10 m respectively. Unconfined compressive strength of the soft clay is 50 kN/m^2. If the piles were spaced 900 mm centre to centre, compute the allowable load on the pile group on the basis of shear failure criteria for a factor of safety of 2.5. Take Adhesion factor = 0.6. (10)

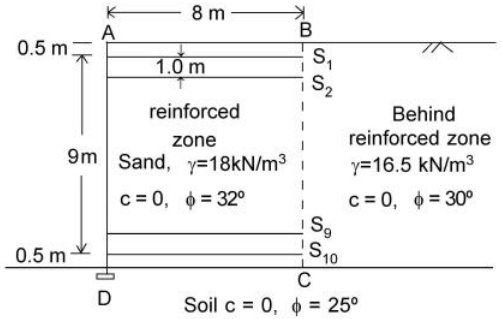
SECTION - D

7, (a) Discuss various methods to rectify the tilt with sketches. (10)

[P.T.O.]

(b) Derive the expressions of natural frequency and amplitude of a block foundation subjected to vertical vibration. (10)

8. Check the reinforced earth wall for stability against (a) sliding (b) overturning and (c) bearing failure. Although BC is a rough face, assume it to be smooth. Take $\delta=\phi$ for soil to soil sliding. (20)



for block ABCD allowable soil pressure = 250 kN/m^2

SECTION - E

9. (i) List the situations under which effective stress method of stability analysis is used

(ii) State the assumptions made in Rankine's earth pressure theory.

(iii) Why the calculated depth of cantilever sheet pile wall is increased by 20 to 40%?

(iv) Give the important parameter to fix the significant depth of exploration.

(v) Mention the factors that affect the selection of type of foundation.

(vi) What are the corrections required for SPT-N value?

(vii) What are the different types of shear failures?

(viii) Mention the components of settlement of foundation.

(ix) Under what circumstances the raft foundation is used?

(x) Under what circumstances the negative skin friction will develop? (2×10=20)