End Semester Examination, Autumn Semester, 2012-13

Sub. No: - CE 31402 **Subject: - Advanced Foundation Engineering**

Time: - 3 hrs **Max. Marks: 50**

Answer all the questions (assume any suitable value if required)

Q1. Design a 8m high geotextile retaining wall is to backfill with granular soil having properties of $\gamma_{backfill}$ = 19 kN/m^3, $\delta_{backfill}$ =32°, $\phi_{backfill}$ = 35°, K_a = 0.28, and c $_{backfill}$ = 0. A geotextile with allowable tensile strength of 25 kN/m is intended to be used in its construction. The foundation soil properties are given as: $\gamma_{foundation}$ = 20 kN/m^3, $\phi_{foundation}$ = 10°, $\delta_{foundation}$ = 0.95$\phi_{foundation}$, c = 25 kN/m^2, c_a = 0.8c. Check the stability only for overturning and sliding. The factor of safety against overturning and sliding is taken as 3. Consider a uniform surcharge of 10 kN/m^2 acting on the reinforced retaining wall. **[10]**

Q2. (a) Describe how tip resistance and friction resistance of pile can be separately determined by pile load test. **[5]**

(b) A group of 9 piles passes through a recently filled up vary soft clay. The depth of fill = 3m. The diameter of pile is 300mm and spacing is 900mm. If c_u = 20 kN/m^2, γ= 15 kN/m^3, compute the negative frictional load on the pile group. **[3]**

(c) Describe why the bearing capacity of foundation increases due to the application of geosynthetic reinforcements below the foundation. Why sufficient length of the reinforcements beyond the failure line is required? **[2+2]**

Q3. The following observations relate to a plate load test conducted on a 30 cm square test plate placed at a depth of 1.5 m below ground surface in a cohesionless soil deposit:

Intensity of load (kg/cm^2)	0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0
Settlement (mm)	0	2.0	4.0	7.0	11.0	16.0	23.0	32.0	45.0

Determine the size of a square footing for a column carrying a load of 1000 kN with a maximum permissible settlement of 25 mm. The depth of the foundation is restricted at 2.0 m below ground surface. Apply Fox's depth correction in settlement. Density of the soil is 18 kN/m^3. Neglect the water table effect. **[8]**

Q4. (a) What are the various types of well foundation based on the method of construction? Write the advantages and disadvantages of each type. **[1+3]**

(b) Describe how depth of well foundation is determined. **[2]**

(c) What are the difference between SPT, SCPT and DCPT? **[2]**

(d) When piles are subjected to uplift and lateral load? **[2]**

Q5. Design a raft foundation for the building frame shown in Fig. 1(b). The soil data are given in Fig. 1(a). Each column is carrying 400 kN load. The factor of safety is taken as 2.5 against shear failure. Take pore water correction factor as 0.75. Use Skempton's bearing capacity equation for clay soil. Take E = 600 c_u and μ = 0.5. The foundation is located at a depth of 1.5 m below ground surface. Dimension of each column is 250 mm x 250 mm. **[10]**

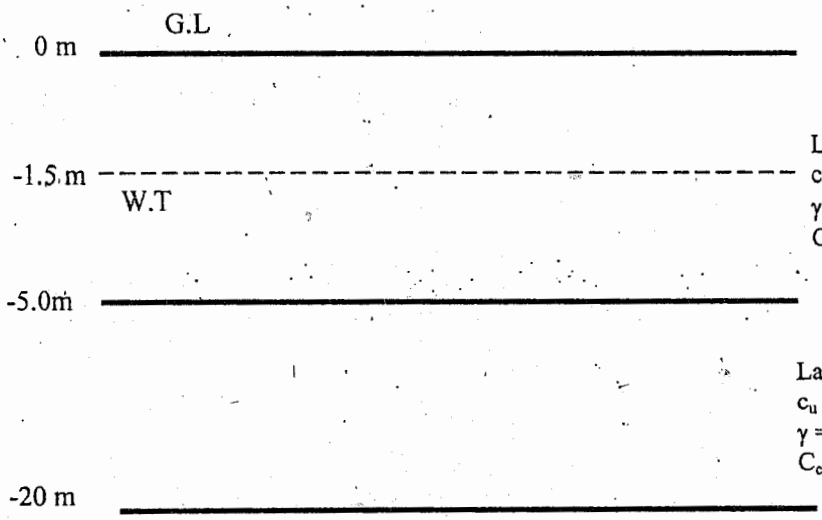

Fig. 1(a)

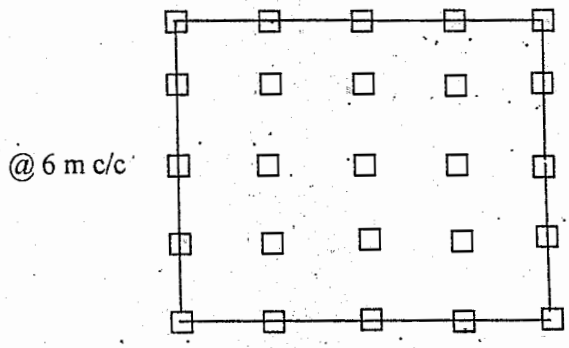

Fig. 1(b)

Influence Factor, I_f for Vertical Displacement

Shape	I_f Flexible Foundation
	Centre
Square	1.12
Rectangle	
L/B = 1.5	1.36
L/B = 2.0	1.52
L/B = 5.0	2.10
L/B = 10	2.52
L/B = 100	3.38

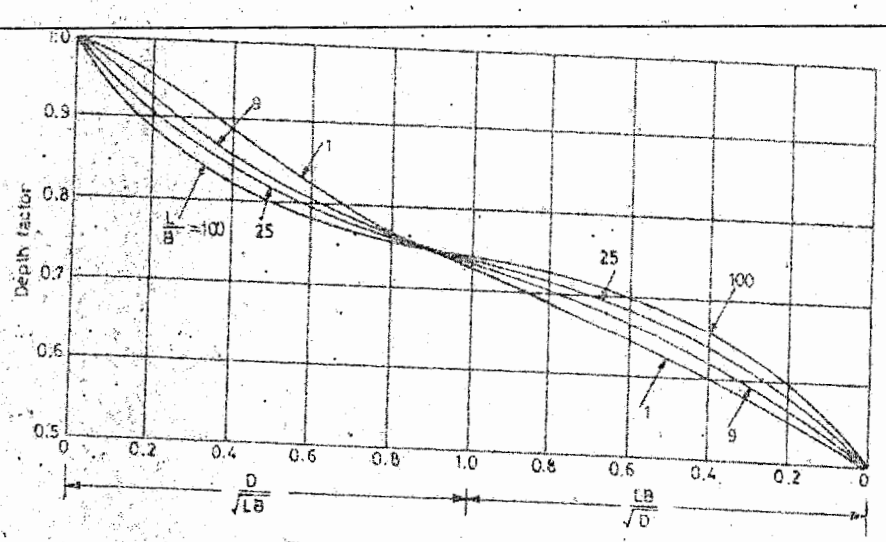

Fig. 15.18 Fox's depth correction factor

at of Settlement