NAME	HAMZA EJAZ
SUBMITTED BY	7835
SUBMITTED TO	Sir Liaqat
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SUBJECT	GEOTECH & Foundation Eng
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Qno 2 Define the following terms

(i) Compressive Index:-

It represents deformation characteristics of overconsolidated soil. It describes variation of the void ratio 'e' as a function of change of effective stress

$$C_c = \frac{\Delta e}{\log c\,(P_2/P_1)}$$

ii) Angular Distortion:-

It is defined when two foundation support walls and columns settled unequally. It means the structure is subjected to angular distortion.

iii) Ultimate Bearing Capacity:-

It is the maximum pressure at the foundation of structure causing shear failure in the soil. It is denoted by "q_o"

iv) Plastic Equilibrium :-

Plastic Equilibrium is that state in a soil after which the soil could not resist more stress i.e ultimate shearing resistance of soil is acheived.

v) Poisson Ratio of Soil :-

It is the negative ratio of transuesal strain to the axial strain in an elastic material which is subjected to uniaxial stress.

(1) NO 1

(B) Given Data :-

$H = 6m$ $\quad C = 0$ $\quad \phi = 30^\circ$

$\gamma = 19.2\ kN/m^3$, slope : H : 3, V = 1

Required :-

$\frac{Va}{b} = ?$ $\qquad \frac{Vo}{b} = ?$

$$\frac{Pa}{b} = \frac{\gamma \times H^2 \times Ka}{2}$$

$$\tan B = \frac{1}{3}$$

$$B = \tan^{-1}(1/3)$$

$$B = 18^\circ$$

$$Ka = \cos B \times \frac{\cos B - \sqrt{\cos^2 B - \cos^2 \phi}}{\cos B + \sqrt{\cos^2 B - \cos^2 \phi}}$$

$$Ka = \cos(18) \times \frac{\cos(18) - \sqrt{\cos^2(18) - \cos^2(30)}}{\cos(18) + \sqrt{\cos^2(18) - \cos^2(30)}}$$

$$Ka = 0.395$$

$$\frac{Pa}{b} = \frac{\gamma \times H^2 \times Ka}{2}$$

$$= \frac{19.2 \times 6^2 \times 0.395}{2}$$

$$\frac{Pa}{b} = 136.512 \text{ KN/m}$$

$$\frac{N_a}{b} = \frac{P_a}{b} \cos B$$

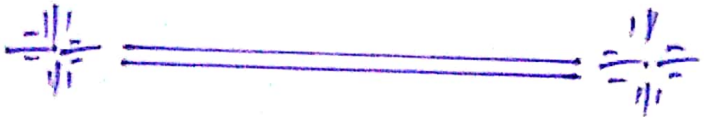
$$= 136.512 \cos(18)$$

$$\frac{N_a}{b} = 129.83 \text{ KN/m}$$

$$\frac{N_a}{b} = \frac{P_a}{b} \sin B$$

$$= 136.512 \sin(18)$$

$$\frac{V_a}{b} = 42.18 \text{ KN/m}$$



Q.No 2

(A) BEARING CAPACITY:-

The Load Bearing capacity of foundation soil or rock which enable it to bear and transmit loads from a structure

"OR"

An Engineering property of soil due to which the soil resist the

applied load.
The bearing capacity is also known as The internal strength denoted by "q"

Factor EFFECTING BEARING CAPACITY:-

1) Relative Density:-

Greater the relative density of soil higher will be the value of angle of internal furdion "Φ" higher the value of terzaghi bearing factor (N_q, N_c, N_γ)

Greater the value of N_c, N_γ, N_q will resist in high value of bearing capacity.

The soil having enough relative Density have enough bearing capacity

Relative Density ⇒ relative $\frac{I_m - e}{e_{max} - e_{min}}$

ii) Breath of footing:-

more the of footing or foundation more will be the bearing capacity of soil. It will be more in case of dense soil/sand as compared with loose or medium soil.

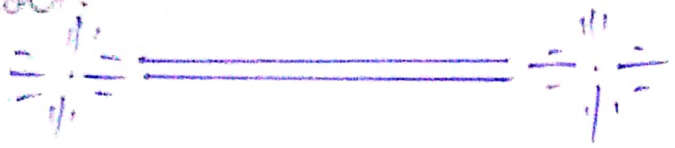
iii) Depth of footing:- The bearing capacity of soil increase with the increase of depth of footing The increase will be maximum for the dense soil/sand as compare to loose soil.

iv) water table:-

As the water table comes near to footing, the bearing capacity get decrease.

v) Unit wt of Soil :-

Bearing capacity of soil is directly proportional to unit weight of soil increase with increase in its weight. It will be more incase of dense soil.



(1) No 2

(B) Given DATA:-

$L = 3m$, $B = 2m$ $D_f = 1.6m$

$\gamma = 18 KN/m^3$, $C_u = 20 KN/m^3$

$F.O.S = 3$, $\phi = 20^\circ$

Required :-

$q_s = ?$

Formula

$q_u = C N_c S_c d_c i_c + q N_q \cdot s_q d_q i_q + \frac{1}{2} \gamma B N_\gamma S_\gamma d_\gamma i_\gamma$

As there is no 'B' so

$i_\gamma = i_r \cdot 1$

Shape factors :-

$$\alpha = \frac{\phi}{2} + 45$$

$$\alpha = \frac{20}{2} + 45$$

$$\alpha = 55^\circ$$

$$S_c = 1 + 0.2 \frac{B}{L} \tan\alpha$$

$$= 1 + 0.2 (2/3) \tan^2 (55)$$

$$= 1.27 \simeq 1.3$$

$$S_q = S_\gamma = 1 + 0.1 \frac{B}{L} \tan^2 \alpha$$

$$= 1 + 0.1 \, D/3 \, \tan^2 (55)$$

$$= 1.14$$

Depth factors :-

$$d_c = 1 + 0.2 \frac{D}{B} \tan\alpha$$

$$= 1 + 0.2 \frac{1.6}{2} \tan (55)$$

$$= 1.23$$

$$d_\gamma = d_q = 1 + 0.1 \frac{D}{B} \tan\alpha$$

$$= 1 + 0.1 \left(\frac{1.6}{2}\right) \tan (55)$$

$$= 1.11$$

putting values in the formula

$$\Rightarrow (20 \times 14.8 \times 1.3 \times 1.23 \times 1) + (18 \times 1.6) \times (6.4 \times 1.1 \times 1.11 \times 1) + (0.5 \times 20 \times 2 \times 2.9 \times 1.4 \times 1.14 \times 1)$$

$q_u = 762 \text{ kN/m}^2$

$q_{nu} = q_u - \gamma D_f = q_u - \gamma D_f$

$= 762 - (18 \times 1.6) = 733.2 \text{ kN/m}^2$

$q_{n1} = \frac{q_{nu}}{F.O.S} = \frac{733.2}{3} = 244.4 \text{ kN/m}^2$

$q_s = q_{n1} + \gamma = q_{ns} + \gamma D_f$

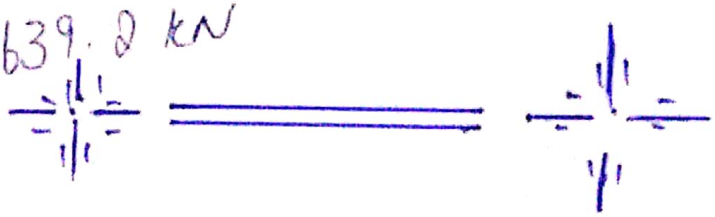
$= 244.4 + (18 \times 1.6)$

$q_s = 273.2 \text{ kN/m}^2$

total safe on rectangular footing

$A \times q_s = (2 \times 3) \times 273.2$

$= 1639.2 \text{ kN}$



Q No 3

A) What is settlement. What are its type explain in detail?

Settlement:-

When load is applied on the ground surface that will produce effective vertical stresses, due to these stresses the effective vertical strain will be produced as result of which the movement will occur in the downward direction - this downward movement is called settlement.

Type of Settlement:-

On the basis of movement of the structure it is divided into two types

1. Total settlement
2. Different settlement

1). Total Settlement:-

It is also called uniform settlement on this type of settlement each part of structure will settle equally. In uniform settlement the failure of the structure is not much as considered as with differential settlement. The total settlement mostly take place in a structure which are constructed in rigid footing in this type of settlement the utility services such as water supply, electricity, sewage telephone etc may be decreased and the structure will remain sound.

Limitation For Total Settlement:-

The soil layer to which the load is to be transfer should be sufficient in bearing to resist the load which is to be applied on it.

2) Different Settlement:-

Different settlement in different parts of the same structure is called differential settlement. Differential settlement is more danger as compared with uniform settlement. Because it causes more damage to a structure as compared to total settlement

There are two types:-

(i) Tilt
(ii) Angular Distortion

1) TILT:-

If the entire structure rotates due to unequal settlemait is called tilt

2) Angular Distortion:-

When two foundations support walls columns settlement unequally it means the structure is subjected to angular distortion.

Q3

(B)

Given DATA:-

$C_c = 0.3$ $\quad P_1 = 130\ KN/m^2$

$e_0 = 1.02$ $\quad P_2 = 170\ KN/m^2$

$H = 5m$

Required:-

$e_i = ?$

$S_c = ?$

$$C_c = \frac{S_c}{\log_{10}(P_2/P_1)}$$

$$= \frac{e_0 - e_i}{\log_{10}(P_2/P_1)}$$

$$0.31 = \frac{1.02 - e_i}{\log_{10}(170/130)}$$

$$e_i = 0.983$$

Now $\quad S_c = \frac{H}{1+e_0} \times C_c \log_{10}(P_2/P_1)$

$$= \frac{5}{1+1.02} \times 0.31 \log_{10}(170/130)$$

$$S_c = 89.4\ mm.$$