MID term Paper

online

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Subject : Geotechnical

Semester : 6th

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Section : B

Q#01: Define the following term.

Ans:

Part (a):

(1) Plastic Equilibrium:-

Plastic equilibrium is the state of stress with in a soil mass or a portion there of that has been deformed to such an extent that its ultimate shearing resistance is mobilized.

(2) Angular Distortion:-

Angular distortion is the ratio of the differential settelment δ and the dischance I between two point.

(3) Compressive Index:-

Compressive indeu is use to find the settelment in the normally consolidated clay. The total stress applied is larger then the stress in the field to which the soil sample has been undergone. in the past this kind of clayey soil is said to be normally consolidated clay.

(4) Ultimate bearing capacity:-

Ultimate bearing capacity is the theoretical maximum pressure which the soil can be supported without failure.

(5) Poission Ratio of Sal:- Poission ratio is the negative ratio of transverse to axial strain

Q # 01:

Part (b):

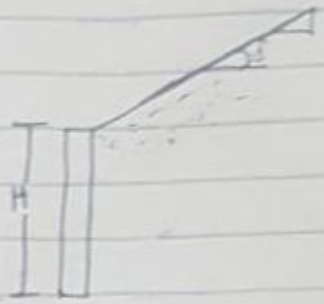
Ans:- Given data:

$H = 6m$

$C = 0$

$\phi = 30^\circ$

$\gamma = 19.3\ KN/m^3$



Slope $H=3, V=1$

Required:- $\frac{Na}{b} = ?, \frac{Va}{b} = ?$

Solution:-

As we know that

$$\frac{Pa}{b} = \frac{\gamma \times H^2 \times Ka}{2} \longrightarrow equ\ (i)$$

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

$$\beta = \tan^{-1}\left(\frac{1}{3}\right)$$

$$\beta = 18^\circ$$

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

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

$$Ka = 0.3948$$

$$Ka = 0.395$$

$$\frac{Pa}{b} = \frac{19.2 \times (6)^2 \times 0.395}{2}$$

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

$$\frac{Na}{b} = \frac{Pa}{b} \cos\beta$$

$$= 136.512 \times \cos(18)$$

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

$$\frac{Va}{b} = \frac{Pa}{b} \sin\beta$$

$= 136.512 \times \sin(18)$

$$\boxed{\frac{Va}{b} = 42.18 \text{ kN/m}}$$

Q # 02:

Part (a):

Ans :- Bearing Capacity :- As engineering property of soil because of which when load is applied on the ground surface and this load is resisted then such capacity of soil is called bearing capacity.

⇒ Factor Affecting bearing Capacity :-

(1) Relative density of soil :- If the relative density of soil is greater. The value of angle of internal friction will be greater Higher will be tarzaghi bearing capacity factor due to which the value of bearing capacity will increase.

(2) Depth of footing:- The bearing capacity increase with increase of depth of footing.

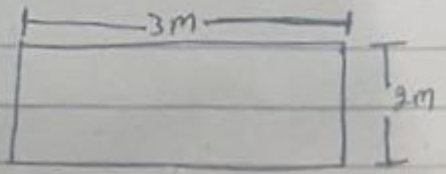
(3) Width of footing:- With increasing the width of footing the bearing capacity is also increase.

(4) Cohesion of soil:- If the soil is more cohesion value the bearing capacity is increase with this.

(5) Water table:- Water table is indirect relation with the bearing capacity due to water the shear strength b/w the soil particals reduce hence bearing capacity is decreases.

Q#02
Part (b)

Ans:- Given data:-



Dimension = B x L
= 2m x 3m

Df = 1.6m

Fos = 3

$\gamma = 18 KN/m^3$

$\phi = 20°$, $Cu = 20\ kN/m^2$

$Nc = 14.8$, $Nq = 6.4$, $N\gamma = 2.9$

Required:-

Maximum safe load $= q_s = ?$

Solution:- As we know that

$$q_u = CNcScdcic + qNqSqdqiq + \frac{1}{2}\gamma BN\gamma S\gamma d\gamma i\gamma$$

Now $ic = iq = I\gamma = 1$

then,

$$q_u = CNcScdc + qNqSq\,dq + 0.5\,\gamma B N\gamma S\gamma d\gamma$$

∴ First find the slope factor

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

$$\alpha = 55°$$

Now, $Sc = 1 + 0.2(B/L)\tan^2 d$

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

$Sc = 1.3$

$\phi > 10$

Then, $S_\gamma = S_q = 1 + 0.1 (B/L) \tan^2 \phi$

$S_\gamma = S_q = 1 + 0.1 (2/3) \tan^2 (55)$

$S_\gamma = S_q = 1.14$

Now, $d_\gamma = d_q = 1 + 0.1 (D/B) \tan \alpha$

$d_\gamma = d_q = 1 + 0.1 (1.5/2) \tan (55)$

$d_\gamma = d_q = 1.11$

Now, $d_c = 1 + 0.2 (D/B) \tan \alpha$

$d_c = 1 + 0.2 (1.5/2) \tan (55)$

$d_c = 1.23$

As, $q_u = C N_c S_c d_c + q N_q S_q d_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma$

$q_u = (20 \times 14.8 \times 1.3 \times 1.23) + (18 \times 1.6) \times 6.4 \times 1.1 \times 1.14) +$

$(0.5 \times 20 \times 2 \times 2.9 \times 1.11 \times 1.14)$

$q_u = 762 \ KN/m^2$

Now, $q_{n.u} = q_u - \bar{S}$ $\quad \bar{S} = \gamma \times D_f$

$q_{n.u} = 762 (18 \times 1.6)$

$q_{n.u} = 733.2 \ KN/m^2$

Then,

$$q_{n.s} = \frac{q_{n.u}}{F.O.S} = \frac{733.2}{3}$$

$q_{n.s} = 244.4 \ KN/m^2$

Now,

$q_s = q_{n.s} + \bar{S}$

$q_s = 244.4 + (18 \times 1.6)$

$q_s = 273.2 \ KN/m^2$

Total saf load on Rectangular footing.

$A \times q.s$

$(9 \times 3) \times 273.2$

1639.2 KN

Q#03
Part (a)

Ans:- Settlement:-
When load is applied on the ground surface this will be produce effective vertical stress, due to these stress the effective vertical strain will be produced as result of which the downward Movement is called settlement.

⇒ Types of settlement:-
There are two types of settlement on the basis of movement of structure.

(1) Total settlement.
(2) Differential settlement.

(1) Total settlement:-
This type of settlement is also called uniform settlement. In total settlement each part of structure will settle equally.
→ In uniform settlement the failure of the structure is not much as considered as with the differential settlement.

A uniform settlement mostly occure in that structure which are constructed in rigid footing.

-> In this type of Settlement the utility services such as water supply electricity, sewage line telephone etc

=> 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 to spread the comming load over a large area

(2) Differential Settlement :- Differential Settlement in different part of same structure is called differential settlement

-> Differential settlement are more dangerous ondesirable as compare with total settlement because they are cause more demage to a structure

=> TYpes of differential Settlement :-

(1) Tilt
(2) Angular Distortion

(1) Tilt :- If the entire structure rotate due to unequal settlement is called tilt

(2) Angular Distortion:- When two foundation Support walls Column Settle unequally its mean the structure to angular distortion

Q# 03
Part (b)
Ans: Given data:-

$C_c = 0.31$

$e_o = 1.09$

$P_1 = 130 \, KN/m^2$

$P_2 = 170 \, KN/m^2$

$H = 5m$

Required:-

$e_1 = ?$

$S_c = ?$

Solution:- As we know that

$$C_c = \frac{\Delta e}{\log\left(\frac{P_2}{P_1}\right)}$$

$$C_c = \frac{e_o - e_1}{\log\left(\frac{P_2}{P_1}\right)}$$