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QNO1 (a)

Define the following terms:-

(a) plastic equilibrium:-

A body of soil is said to be in state of plastic equilibrium if every part of soil is on the verge of ~~and~~ failure is plastic equilibrium.

(b) Angular Distortion:-

It can defined as the ratio b/w the ratio Deflection b/w two point in foundation and the distance b/w them is called angular distorbtion:-

(c) Ultimate Bearing Capacity:-

it is defined as the gross pressure Intensity at the base of foundation which whould case shear failure is called ultimate bearing capacity.

⇒ poission Ratio of Soil-

It is defined as poission ratio(n) is the negative of ratio of transversal strain to the axial strain in an elastic materials which is subjected to an uniaxial stress-

⇒ Compressive Index-

Soil Compressive Index is define as

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

D = Change in void ratio

P_1 = pressure when void ratio in e

P_2 = when void ratio is e_2

QNO1 (b)

Given data:-

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

$\gamma = 19.2 KN/m^3$

Slope $H = 1, \ V = 3$

Required:-

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

Solution:-

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

$\beta = \tan\beta = 113 \Rightarrow \beta = \tan^{-1}(113)$

$\beta = 18^\circ$

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

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

$= Ka = 0.3848 \approx 0.395$

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

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

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

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

$$= 129.83 \text{ KN/m}$$

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

$$= 136.516 \times \sin(18) = 42.18 \text{ KN/m}$$

∴ Result

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

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

QNO2:- (a) What is Bearing Capacity? Also Write Factor effecting bearing Capacity:-

⇒ ANSWER:-

The engineering property of the soil due to which it resist the applied load- denoted by Q

In other words the Internal Strength of Soil is called bearing Capacity-

⇒ Factor effecting bearing Capacity:-

1. Relative Density of Soil
2. Depth of Footing
3. Breadth of Footing
4. Unit weight of Soil
5. water Table-

⇒ Relative density of Soil:- More Relative density of soil more will be its angle of Friction more will be Nq, Nc, Nr, will Increase of this bearing Capacity Increase-

⇒ **DEPTH OF FOOTING**:- With the Increase of depth of foundation the bearing Capacity of Soil will increase this increase will be more if Soil is dense-

⇒ **Breadth of foundation**:- More the breath of foundation more will be bearing Capacity of Soil.

⇒ **Unit weight of Soil**:- Bearing Capacity of Soil is directly proportional to unit weight of Soil the bearing Capacity of Soil Increase with Increase in unit weight-

⇒ **Water table**:- As water table come near Surface bearing Capacity decreases-

QNO2 (b)

Given datas: $L = 3m$, $B = 2m$, $D = 1.6m$

$F.O.S = 3$ $\quad \gamma = 18 KN/m^3$ $\quad \phi = 20^\circ$

$C_u = 20 KN/m^2$

Required:-

$q_s = ?$

Solution:-

$$q_u = cN_c S_c d_c + qN_q d_q S_q + \frac{1}{2} \gamma B N_\gamma d_\gamma S_\gamma$$

First For Shape Factor:-

$$\alpha = \left(45 + \frac{\phi}{2}\right) = \left(45 + \frac{20}{2}\right)$$

$$\alpha = 55^\circ$$

$$S_c = 1 + 0.2 \left(\frac{B}{L}\right) \tan^2 \alpha$$

$$S_c = 1.02 \left(\frac{2}{3}\right) \tan^2 (55) = 1.27 \approx 1.3$$

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

$$= 1.1 \left(\frac{2}{3}\right) \tan^2 (55) = 1.4$$

$$S_q = S_\gamma = 1.4$$

Depth Factor:- $d_c = 1 + 0.2 \left(\frac{D}{B}\right) \tan \alpha$

$$= 1 + 0.2 \left(\frac{1.6}{2}\right) \tan (55) \Rightarrow 1.23$$

$$d_\gamma = 1 + 0.1 \left(\frac{D}{B}\right) \tan \alpha$$

$$= 1 + 0.1 \left(\frac{1.0}{2}\right) \tan (55)$$

$$= 1.11$$

$q_u = CNC\,sc\,dc + q \cdot N_q \cdot d_q\,s_\delta + \frac{1}{2}\gamma B N_\delta d_\delta s_\delta$

$= (20 \times 14.8 \times 1.3 \times 1.23) + (18 \times 1.6 \times 6.4 \times 1.11 \times 1.14)$
$+ (0.5 \times 20 \times 2 \times 2.9 \times 1.11 \times 1.14)$

$q_u = 762\ KN/m^2$

$q_{n.u} = q_u - \bar{\delta}$ $\quad \because \bar{\delta} = \delta \times D$

$= 762 - (18 \times 1.6)$

$= 733.2 KN/m^2$

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

$= 244.4\ KN/m^2$

$q_s = q_{n.s} + \bar{\delta} \Rightarrow 244.4 + (1.6 \times 18)$

$= 273.2 KN/m^2$

Total Safe load on Rectangular Footing-

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

$= 1639.2 KN$

Q NO3 (a)& What is Settlement? Explain Types and details.

Answer& SETTLEMENT& when load is applied on the ground Surface this will produce effective vertical Stresses due to those ~~of~~ stresses effective vertical Strain will be produced as a result of which the movement will occour in downward movement is called Settelments.

Types&
On the base of moment ve of the Structure it is divided into two Types.

(i) Total Settlement
(ii) Differential Settlement

=> Total Settlements& It is also called Uniform Settlement in their Types of 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.

The Total Settlement mostly take place in the Structure which are Considered in rigid footing (Raft) in this type of Settlement the utility Services Such as water Supply electricity Sewage line Telephone- e.t.c may be will remain Sound.

=> Differential Settlement:-

Differential Settlement in different part of the Same Structure Settle is called differential Settlement it is more danger then Total Settlement it cause more demage to Structure-

Types of Differential Settlement.

① Tielt ② Angular distortion.

QNO3 (b)

Given data:- $C_c = 0.31$ $p_1 = 130 KN/m^2$

$e_c = 1.02$ $p_2 = 180 KN/m^2$ $H = 5m$

Required:- void ratio, $e = ?$

$S_c = ?$

Solution:-

$$C_c = \frac{\Delta e}{\log_{10}\left(\frac{P_2}{P_1}\right)} = \frac{e_2 - e_1}{\log_{10}(P_2/P_1)}$$

$$0.31 = \frac{1.02 - e_1}{\log_{10}(170/130)} \Rightarrow e_1 = 0.54$$

NOW $$S_c = \frac{H}{1+e_0} \times C_c \log_{10}\left(\frac{P_2}{P_1}\right)$$

$$= \frac{5}{1+1.02} \times 0.31 \log_{10}\left(\frac{170}{130}\right) \times 1000 mm$$

$$S_c = 1003.427$$

Result $e_1 = 0.54$

$S_c = 1.003.427$