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Q.NO.1 # (a)

Q:

Ans:. **plastic Equilibrium:.** **Defenition:.** A body of Soil is Said to in state of plastic equilibrium is called plastic equilibrium.

* If every part of soil is an the vage of failure is called plastic equilibrium.

Angular Distortion:.

Defenition:. It is defined as the ratio between the relative deflection between two points in a foundation and the distence between them is angular distortion.

Compressive Index:.

Defenition:. Soil Compressive index is define as

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

∴ Δ = change in void ratio
∴ P_1 = Pressure when void ratio in e
∴ P_2 = When void ratio in e_2.

ultimate Bearing Capacity: The grass pressure Intensity at the base of foundation which would cause shear failure is called ultimate bearing capacity.

poission ratio of ratio:.

Defenition: poission ratio(n) is the negative of ratio of transversal strain to axial strain in elastic material which is subjected to an unaxial Stress.

Q.NO#1 (b)

Q:

Ans:

Given Data:

$H = 6m$, $C = 0$

$\phi = 30^\circ$, $\gamma = 19.2 KN/m^3$

Slope $H = 1$, $V = 3$

Required Data:

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

Solution:

As we know that

$$\frac{Pa}{b} = \frac{\gamma + H^2 + Ka}{2} \Rightarrow \beta = \tan\beta = 1/3$$

$$\beta = \tan^{-1}(1/3) \Rightarrow \beta = 18^\circ$$

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

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

$$\Rightarrow Ka = 0.3948$$

$$\Rightarrow Ka = 0.395$$

$$Pa/b = \frac{19.2 \times 6^2 \times 0.395}{2} \Rightarrow Pa/b = 136.512 KN/m$$

③

$N_{a}/b = P_{a}/b \cos\beta$

$= 136.512 \times \cos(18)$

$\Rightarrow 129.83\ KN/m$

$V_{a}/b = \frac{P_a}{b} \sin\beta$

$= 136.512 \times \sin(18)$

$= 42.18\ KN/m$

Result:-

$N_{a}/b = 129.83\ KN/m.$

$V_{a}/b = 42.18\ KN/m.$

Q.NO#2(a):.

Q:

Ans:: **Bearing Capacity**:. The engineering property of the soil due to which it resist the applied load.

Denoted by:. "q"

*. In other words the internal strenght of soil is Called b.capacity.

Factors effecting bearing Capacity:.

*. Relative density of soil:-
*. Depth of footing:-
*. Breadth of footing:-
*. Unit wt of soil:-
*. Water Table:-

Relative Density of Soil:. More relative density of soil more will be its angle of friction more will be, N_q, N_c, N_γ, will be with increase of this bearing capacity increase.

Depth of Footing:. *With the Increase of depth of foundation more will be capacity of soil will increase. more if soil if the soil is dense.

Breadth of Foundation:. More the breath of foundation more will be bearing capacity of soil.

Unit wt of soil:. Bearing capacity of soil is directly proportional to Unit wt of soil. The bearing capacity of soil increase with increase in Unit weight.

Water Table: As water table comes near surface bearing capacity decrease.

Q.NO# 2 (b)

Given Data:

$l = 3m$, $B = 2m$, $D = 1.6m$

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

$C_u = 20 KN/m^2$

Required data: $q_s = ?$

Solution:

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

First for shape factor:

$\Rightarrow \alpha = (45 + \phi/2) = (45 + 20/2) \Rightarrow \boxed{\alpha = 55°}$

$\Rightarrow S_c = 1 + 0.2 (B/L) \tan^2\alpha = 1.02 (2/3) \tan^2(55)$

$\boxed{\Rightarrow S_c = 1.27 = 1.3}$

$\Rightarrow S_q = S_\gamma = 1 + 0.1 \, B/L \, \tan^2\alpha$

$\Rightarrow = 1.1 (2/3) \tan^2(55)$

$\boxed{\rightarrow S_q = S_\gamma = 1.14}$

Depth factor: $\Rightarrow d_c = 1 + 0.2 (D/B) \tan\alpha \Rightarrow 1 + 0.2 (1.6/2) \tan(55)$

$\boxed{\Rightarrow d_c = 1.23}$

$d_\gamma = d_q = 1 + 0.1 (D/B) \tan\alpha \Rightarrow 1 + 0.1 (1.6/2) \tan(55)$

$\Rightarrow 1.11$

$q_u = C \cdot N_c \cdot S_c \cdot d_c \times q \cdot N_q \cdot d_q \cdot S_q + \frac{1}{2} \gamma \cdot B \cdot N_\gamma \cdot d \cdot S_q$

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

$q_u = 762 \, KN/m^2$

$q_{n.v} = q_u - \bar{s} \Rightarrow 762 - (18 \times 1.6) \quad \bar{s} = \gamma \times D = 733.2 \, KN/m^2$

$\Rightarrow q_{n.s} = \frac{q_{n.v}}{F.O.S} = \frac{733.2}{3} = 244.4 \, KN/m^2$

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

$q_s = 273.2 \, KN/m^2$

Total Safe Load on Rectangular Footing:

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

$\Rightarrow 1639.2 \, KN$

Q.NO.3 #(a):- ⑦

Q:-

Ans:- Settlement:-

Explanation:- When load is applied on the ground surface this will produce effective verticale stresses, due to these stresses e strain will be produced as a result of which the movement will occure in downward direction. This downward movement is called Settlement.

Types of Settlement:- On the basis of movement of the structure it is divided into two types.

(i) Total Settlement:-
(2) Differential Settlement:-

Total Settlement:- It is also called uniform settlement. In 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 the structure which are constructed on ragid footing.

Differential Settlement:- *. Different settlement in different part of same structure is called differential Settlement.

*. Differential settlement is more danger then the total settlement.

*. It cause more damage to structure.

(8)

Types of differential Settlement:.

(1) Tilt

(2) Angular distortion:.

Q. NO 3 # (b)

Given Data:.

$C_c = 0.31$, $P_1 = 130 KN/m^2$, $e = 1.02$

$P_2 = 180 KN/m^2$, $H = 5m$.

Required data:.

(i) Void ratio, $e_1 = ?$

(2) $S_c = ?$

Solution:- Formula ⇒ $C_c = \frac{\Delta e}{\log_{10}(P_2/P_1)}$

$$C_c = \frac{e_0 - e_1}{\log_{10}(P_2/P_1)}$$

⇒ putting values

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

$$\boxed{e_1 = 0.54}$$

Now

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

putting the values

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

$S_c = 1003.427$

Result:-

$e_1 = 0.54$

$S_c = 1003.427$