MID TERM
Online Exam

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ID 7878

Section A

Semester 6th

Submitted to Engr liaquat.

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Q.No.1A Define the following terms.
1) plastic equilibrium
2) Angular Distortion
3) compressive index
4) Ultimate Bearing capacity
5) poission Ratioh of soil.

1) plastic equilibrium.
The State of Stress within a soil mass of a portion thereof that has been deformed to such an extent that it ultimat Shearing resistance is mobilized.

2) Angular Distortion.
The Angular Distortion is the angular change in relative position of members extending from a weld area That there is shorter with of contracting weld metal at the root weld each weld than that at the face.

3) compressive index
The compressive is used to find the settlement in the normally consolidated clay the total Stress in th field to which the Soil Sample has been under gone in the past this kind of claysy Soil is Said to be normally consolidated clay.

4) Ultimate Bearing capacity.
Denoted by (qu)
The max pressur at the base of the footing which cause Shear failur in the Soil The Soil can be supported with out failure.

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5) poission Ratio of soil

The poission ratio is the negative ratio of transuerse to axial strain. The Soil mechanic plainly possion ratio is the negative of ratio of elastic materal which is subject to an unianial Stress.

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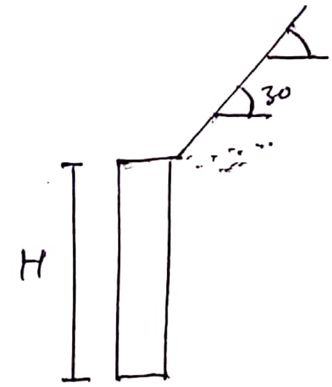
Q1B

A 6m tall cantilever wall retaining the Soil that has the following properties.

$C=0$ · $\phi=30$ · $\gamma=19.2\,kN/m^3$

And the ground Surface behind the wall is inclined at a Slope of horizontal and 1 vertical the wall has moved sufficiently to develop active condition Determine the total normal and Shear forces acting on the back of this wall ushing Rankine's theory.



Give data:

$H=6m$

$C=0$

$\phi=30$

$\gamma=19.2\,kN/m^3$

Slope $H=3, V=1$

Reqirmente.

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

Solution.

we know that

$$\frac{Pa}{b}=\frac{\gamma\times H^2\times ka}{2} \longrightarrow (1)$$

$\beta=18^0$

$\tan\beta=1/3$

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

$\beta=18^0$

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

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

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$Ka = 0.3948$

$Ka = 0.395$

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

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

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

$= 136.512 \times \cos(18)$

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

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

$136.512 \times \sin(18)$

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

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Q2A What is Bearing capacity Also write factor effecting Bearing capacity.

Ans Bearing capacity:-

The 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.

↳ It is also called the internal Strength of the Soil Denoted by "q"

factors effecting Bearing capacity.

→ Relative density of the Soil:-

Greater the Relative Density of Soil higher will be the value of angle of internal friction (Ø) and higher will be Terzaghi bearing capacity factors (N_c, N_q, N_γ) due to which the value of Bearing capacity will increase.

→ Depth of the footing:

As $q_u = CN_c + \gamma D_f N_q + \frac{1}{2} \gamma \cdot B \cdot N_\gamma$

So $q_u \propto D_f$

~~will qu~~

Soil type → dense
↓
will increase the q_u

The bearing capacity increse with increase of depth of the footing this increase is maximum for the dense soil as compared to loose Sand.

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→ widith of the footing.
The bearing capacity increse with increase of width of the ~~fott~~ footing will increase will be max for the dense soil as compared to base send.
footing will be the bearing capacity is also increase

→ unit weight of the soil.

$qu = cNc + \gamma Df\, Nq + \frac{1}{2}\, \gamma \cdot B\, N\gamma$

increase γ will increase in qu.

Bearing capacity of soil the bearing capacity of Bearing capacity of soil is directly proportional to unit weight of soil the bearing capacity of Soil increase. it will be more incase of dense Soil/~~d~~ Send as compared with or medium soil/send.

water table:.
As water table come neal to footing the bearing capacity get decrese.
water table is indirect relation with bearing capacity due to the water Shear strength and the soil particals reduce hence bearing capacity in decreas.

→ cohesion of the soil.
The ~~Soi~~. bearing capacity of soil is more cohesion value to the bearing capacity ~~ia~~ is increase with this cohesion of the soil.

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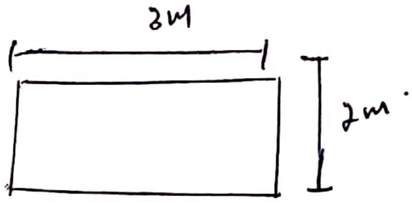
Q2 B

What is the maximum Safe load which can be Supported by rectangular footing 23 by 3m with a B Safety factor of 3. The base of the footing is at 1.6 m below the ground Surface the unit weight of Soil is 18 kN/m³ the angle of Shear resisting $\phi = 20°$ ($N_c = 14.8$ $N_q = 64$ $N_\gamma = 2.9$) unit cohesion $C_u = 20 kN/m^2$ use meyerhaf analysis.

Given Data:-

Dimension = B×L = 2m × 3m



$D_f = 1.6m$

$Fos = 3$

$\gamma = 18 kN/m^3$

$\phi = 20°$

$C_u = 20 kN/m^2$

$N_c = 14.8$ $N_q = 6.4$

$N_\gamma = 2.9$

Requairment

Maximum Safe load $= q_s = ?$

Solution.

we know that

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

↳ Now $i_c = i_q = I_\gamma = 1$

Then

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

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first find the Slop factor

$$\alpha = 45 + \phi/2 = 45 + 20/2$$

$$\alpha = 55^\circ$$

Now

$$S_c = 1 + 0.2\,(B/L)\tan^2\alpha$$

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

$$S_c = 1.3$$

$\phi > 10$

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

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

$$S_\gamma = S_q = 1.14$$

Now

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

$$d_\gamma = d_q = 1 + 0.1\,(1.6/2)\tan(55)$$

$$d_\gamma = d_q = 1.11$$

Now

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

$$d_c = 1 + 0.2\,(1.6/2)\tan(55)$$

$$d_c = 1.23$$

As.

$$q_u = cN_cS_cd_c + qN_qS_qd_q + 0.5\gamma BN_\gamma S_\gamma d_\gamma$$

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$$q_u = (20 \times 14.8 \times 1.3 \times 1.23) + (18 \times 1.6) \times 6.4 \times 1.1 \times 1.14) + (0.5 \times 20 \times 2 \times 2.9 \times 1.11 \times 1.14)$$

$$q_u = 762 \ kN/m^2$$

Now

$$q_{n.u} = q_u - \bar{S} \qquad S = \gamma \times Df$$

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

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

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 Safe load on Rectangular footing $A \times q.s$

$$(2 \times 3) \times 273.2$$

$$\boxed{1639.2 \ kN}$$

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Q.No.3A Whate is settlement what are it types explain in detail?

Settlement:-
When the load is applied on the ground surface this will produce effective vertical stresses due to these stresses the effective vertical strain will be produced as result of which the movement will occure in the downwald direction this downwald movement is called Settlement.

Types of Settlement:-

On the that basis of movement of the structule it is divided in two types.
1 - Total settlement
2 - Differential Settlement.

Total Settlement:-
it is also called uniform settlement this type of settement each palt of structule will settle equally.

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In the total Settlement mostly take place in the Structure which are constructed in rigid footing (raft).

in this type of Settlement the utility Services Such as water Supply electricity Sewage line telphone etc. may be decreased and the Struct will Sound.

Limitation for uniform total Settlement.

The Soil layer to which the load is to be tranfer Should be Sofficient in bearing to resist the load which is to be applied on it

↳ To Spread the Coming load over a large area.

Differential Settlement:

Different Settlement in different parts of the Same Structure is called differential Settlement.

Differential Settlement it more danger or undesirable as compared with total uniform Settlement because it Causes more damage to a Structure as compared to total uniform Settlement.

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Types of Differential Settlement:.

~~Two~~ · Differential Settlement of the two type.

1) Tilt
2) Angalar Distartion.

Tilt:: if the entire Structure rotate due to unequal Settlement is called tilt.

Angalar Distartion

When two foundations Support walls/colouns Settle unequally it means the Structure is Subjected to angalar distortion

Component of Settlement in foundation.

1) immediate Settlement
2) primaly consolidation settlement.
3) secondly consoildation Settlement

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Q3 B

A Soil has compressive index $C_c = 0.31$ At a Stress $130 kN/m^2$ the void ration was 1.02 calculate 1- the void ratio if the Stress on the soil increased to $170 kN/m^2$.
2- the total settlement of the Stratum of 5m thickness.

Given Data.

$$C_c = 0.31$$
$$P_1 = 130 kN/m^2$$
$$e_0 = 1.02$$
$$P_2 = 170 kN/m^2$$
$$H = 5m.$$

Requirment:-

$$e_1 = ?$$
$$S_c = ?$$

Solution:.

we know that

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

$$C_c = \frac{e_0 - e_1}{\log\left(\frac{P_2}{P_1}\right)}$$

$$0.31 = \frac{1.02 - e_1}{\log\left(\frac{170}{130}\right)}$$

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$$0.31 = \frac{1.02 - e_1}{0.1165}$$

$0.0361 = 1.02 - e_1$

$e_1 = 1.02 - 0.036$

$\boxed{e_1 = 0.984}$

→ $S_c = ?$

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

$$S_c = \frac{5}{1+0.102} \times 0.31 \log\left(\frac{170}{130}\right)$$

$S_c = 0.08939m$

$\boxed{S_c = 89.3978mm}$