Paper: Geotechinal & foundation Engineering Pg ①

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Q No1 (A) Define the following terms

1) Plastic Equilibrium :—

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

2) Angular Distortion :—

Partiallary reduced by conducting reverse side tungsten inert gas T, G Heating at a fixed distance. a head of metal inert gas (MIG) wedding.

3) Compressive Index :—

The compressive index is used to find the settlement in the normally consolidated clay. The field to. which the soil sample has been

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under gone in the Past. The kind of clayes soil is solid to be normally consilidated clay.

4) Ultimate Bearing capacity :—

In geotechinal Engineering the ultimate bearing capacity in the theoretical maximum pressure which can be supported with out failure allowable bearing capacity is the ultimate bearing capacity divided by a factor of safety.

5) Poission Ratio of Soil :—

Poission Ratio of soil is the negative of ratio of transversal strain to the axial strain an elastic material which is subjected to an uniaxial stress Poission ratio is exactly the ratio between the contraction & Extension

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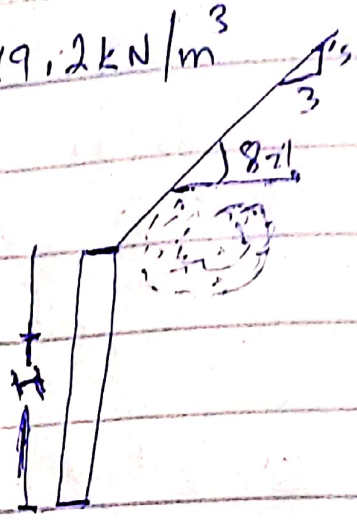
Q1 Part B A 6m tall conti---------- Rankine's Theory

GIVEN DATA:-

$H = 6m$; $C = 0$, $\phi = 30°$, $\gamma = 19.2 kN/m^3$

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



Required :- $\frac{N_a}{b} = ?$, $\frac{V_a}{b} = ?$

Sol:- $\frac{P_a}{b} = \frac{\gamma \times H^2 \times k_a}{2}$

$\beta =$

$\tan\beta = 1/3$

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

$\beta = 18°$

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

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

$k_a = 0.3948$

$k_a = 0.395$.

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

$$= 136.512 \text{ kN/m}$$

$$\frac{N_o}{b} = \frac{P_o}{b} \cos\beta$$

$$= 136.512 \cos(18)$$

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

$$\frac{V_a}{b} = \frac{P_o}{b} \sin\beta.$$

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

$$= 42.18 \text{ kN/m}$$

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Q2 (A) What is Bearing capacity. Also write affecting

Ans: Bearing capacity:-

The bearing capacity of soil is defined as the capacity of the soil to bear the loads coming from the foundation. The pressure which the soil can easily with stand against loads is called allowing bearing pressure.

factor affecting Bearing capacity:-

There are some important factor which affects the bearing capacity which are as follows.

1) Types of soil.
2) Unit weight of soil
3) Surcharge load
4) Depth of foundation
5) Size of footing
6) Mode of failure
7) Shape of footing
8) Depth of water table
9) Eccentricity in footing load.
10) Incillination of footing load.

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1) Incillination of ground.
2) Inclination of base of foundation.

Q2 Part b Problem:— what is the maximum ..... Use meyelof's analysics.

GIVEN DATA:—

$L = 3m, B = 2m, Df = 1.6m, F.O.S = 3$
$\gamma = 18N\ kN/m^3, c = 20kN/m^2, \phi = 20°$

Required:— $q.s = ?$

Solution:— $qu = CNo.Sc.dc + q.Nq.dq.Sq + 1/2\ \gamma.B.N\gamma.d\gamma.S\gamma$

first for the shape factors.

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

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

$Sc = 1.27 = 1.3$

$Sq = S\gamma = 1 + 0.1\ B/L\ \tan^2\alpha \Rightarrow 1 + 0.1(2/3)\tan^2(55°)$

$Sq = So = 1.34$

Depth factor: $d\gamma = 1 + 0.2(B/B)\tan\alpha$

$= 1 + 0.6\left(\frac{1.6}{2}\right)\tan(55)$

$d\gamma = 1.28$

$d\gamma = dq = 1 + 0.1 \times (D/B) \times \tan\alpha$

$= 1 + 0.1 \times (1.6/2)\tan(55)$

$= 1.11$

$qu = 1.Nc.bc.dc + q.Nq.dq.Sq + 1/2\ \gamma.B.N\gamma.d\gamma.S\gamma$

$= (20 \times 14.8 \times 1.3 \times 1.23) + ((18 \times 16) \times 6.4 \times 1.1 \times 1.14) +$
$(0.5 \times 20 \times 2 \times 2.9 \times 1.11 \times 1.14)$

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

$q_{nu} = q_u - \bar{\delta}$ $\qquad \bar{\delta} = \gamma \times D$

$= 762 - (18 \times 1.6)$

$= 733.2 \text{ kN/m}^2$

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

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

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

Total safe load on rectangular footing

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

$\boxed{= 1639.2 \text{ kN}}$

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Q3(A) what is Settlement, what are its types Explain in detail?

Ans: SETTLEMENT:—

when load is applied on the ground surface this will produced 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.

Types of SETTLEMENT:—

On the basic of movement of the structure it is divided into two types.

1) Total settlement.
2) Differential settlement.

TOTAL SETTLEMENT:—

It is also called uniform settlement. In this types of settlement each part of the structure will settle equally In uniform settlement the failure of the structure is not much as

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considered as with the differential settlement. The total settlement mostly take place in the structure which are constructed in rigid footing. In this type of settle the utility services such as water supply, electricity sewage line etc. may be decreased & the structure will remain sound.

LIMITATION FOR UNIFORM/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.

DIFFERENTIAL SETTLEMENT:—

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

Types of Differential settlement:—

Differential settlements is of two types.

1) Tilt
2) Angular Distortion.

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TILT:-

If the entire structure rotate due to unequal settlement is called tilt.

ANGULAR SETTLEMENT:-

When two foundation supports wall/columns settle unequally it means the structure is subjected to angular distortion.