Name : M. Kamran

IDNo : 7888

BE civil

Section B

Q No 1(a)

Define the following

Plastic Equilibrium:

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

Angular Distortion:

It can be define as the ratio b/w the relative deflection b/w two points in a foundation and the distance b/w them is called angular distortion.

Ultimate Bearing Capacity:

It is define as the gross pressure intensity at the base of footing (foundation) which would cause shear failure is called ultimate bearing capacity.

Poission Ratio of Soil:

It is the negative of ratio of transversal strain to the axial strain in an elastic material which is subjected to an unaxial stress.

Compressive Index:

Soil compressive index is define as

$$e_c = \frac{\Delta e}{\log_{10}(P_2/P_1)}$$

Δe = change in void ratio

P_1 = when void ratio is e

P_2 = when void ratio is e_2.

Q1 (a)

A 6m tall steel wall retaining the soil has the following properties.

$C = 0$

$\phi = 28°$

$\gamma = 20.5\ KN/m^3$

Slope Horizontal = 4, Vertical = 1

GIVEN DATA:

$C = 0$

$\phi = 28°$

$\gamma = 20.5\ KN/m^3$

$H = 4, \quad V = 1$

Required:

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

Solution:

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

~~Betaaa~~

$$\tan\beta = \frac{1}{4}$$

$$\beta = \tan^{-1} 1/4$$

$$\beta = 14.03^\circ$$

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

$$= \cos(14.03) \times \frac{\cos(14.03) - \sqrt{\cos^2(14.03) - \cos^2(28)}}{\cos(14.03) + \sqrt{\cos^2(14.03) - \cos^2(28)}}$$

$$K_a = 0.97 \times \frac{0.97 - \sqrt{\cos^2(14.03) - \cos^2(28)}}{0.97 + \sqrt{\cos^2(14.03) - \cos^2(28)}}$$

$$K_a = 0.37$$

$$P_a/_b = \frac{20.5 \times (6)^2 \times 0.37}{2}$$

$$= 136.512$$

$$\frac{N_a}{b} = \frac{P_a}{b} \cos(14.03)$$

$$= 136.51 \times \cos(14.03)$$

$= 132.43$ (5)

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

$$= 136.512 \sin(14.03)$$

$$= 33.09 \text{ KN/m}$$

RESULT:

$$Na/b = 132.43$$

$$Va/b = 33.09 \text{ KN/m}$$

Q NO 2 (a)

Write the assumption of Terzaghi bearing capicity theory

ANSWER:

ASSUMPTION OF TERZAGHI BEARING CAPICITY THEORY

1:- The soil is semi finite

2: the base of footing is rough

3:- the failure is by general shear

4:- the load is vertical and symmetrical

5:- the ground surface is horizontal

9:- Coulomb law is strictly valid.

Q NO 2(b)

GIVEN DATA:

$L = 3m$, $B = 2m$

$D = 1.6m$

$\phi = 20°$

$C_u = 20 kN/m^2$

Req:

$q_s = ?$

Solution:

$q_u = CN_c S_c d_c + q N_q d_q S_q + \frac{1}{2} \gamma \cdot B \cdot N_\gamma \cdot d_\gamma S_\gamma$

Shape factor:

$$\alpha = \left(45 + \phi/2\right) = \left(45 + 20/2\right)$$

$$= 55°$$

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

$$= 1.02 (2/3) \tan^2 (55)$$

$$S_c = 1.30$$

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

$$= 1.14$$

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

$$1 + 0.1 \, (1.6/2) \tan 55^\circ$$

$$= 1.11$$

$$q_U = CN_c \cdot s_c \cdot d_c + qN_q \cdot d_q \cdot s_q + \tfrac{1}{2} \gamma \cdot B \cdot N_\gamma \cdot d_\gamma \cdot s_\gamma$$

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

$$+ 0.5 \times 20 \times 2 \times 2.9 \times 1.11 \times 1.14$$

$$q_U = 762 \text{ KN/m}^2$$

$$q_{n-u} = q_U - \bar{s}$$

$$= 762 - (18 \times 1.6)$$

$$\bar{s} = \gamma \times D$$

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

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

$$\frac{733.2}{3}$$

$$= 244.4 \text{ KN/m}^2$$

$$q_s = q_{n.s} + \gamma$$

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

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

Total safe load

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

$$= 1639.2 \text{ KN}$$

Q NO 3(a) (10)

GIVEN:

Void ratio, $e_0 = 1.02$

$P_1 = 120 kN/m^2$

$e_1 = 0.971$

$P_2 = 180 kN/m^2$

REQ:

Compressive index of soil, $C_c = ?$

Total settlement, $S_c = ?$

Solution:

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

$$= \frac{1.02 - 0.971}{\log_{10}(180/120)} = \frac{0.049}{1.5} = 0.04$$

Now

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

$$= \frac{5}{1+1.02} \times 0.04 \log_{10}(180/120) \, 1000 mm$$

(11 /

$S_c = 140 \cdot 8$

RESOLU:

$C_c = 0 \cdot 04$

$S_c = 140 \cdot 8$.

Q NO 3(b) (12)

Explain component of settlement in detail

ANSWER:

SETTLEMENT:

It is define as

Settlement is de
Vertical moment of the ground generally cause by change of stress in earth.

Component of settlement:

Total settlement of soil has three component.

Elastic settlement

Primary Consolidation

Secondary Compression

Elastic settlement:

It is also called immediate settlement. It take place during or immediatly after construction of structure.

P-T·O

Primary Consolidation:

It is define as the process in which the soil volume decreases. Here, eo is the initial void ratio, δc is the consolidation settlement.

Secondary Compression:

Secondary compression is caused by creep, viscous behaviour of clay water system, compression of organic matter and the other process. It is negligable.