Assignment 7: Applications of Python in the field of Foundation Engineering

DATE:

1. **A 3m square footing is located in a dense sand at a depth of 2 m. Determine the ultimate bearing capacity for the following water table positions.**
   1. **At ground surface**
   2. **At footing level**
   3. **1m below the footing**

Calculate the bearing capacity by approximate formulas and my conventional method. Take bulk density of soil is 18 kN/m', Saturated soil density is 20 kN/m, unit weight of water is 10 kN/m for angle of internal friction of 35' Nq is 33, Ny is 34.

1. **A 450 mm square section of concrete pile 15 m long is driven in a deep deposits of uniform clay. The laboratory UCS test on undisturbed sample indicates an average value of UCS as 75 kN/m. Calculate the ultimate load capacity of soil. ca=0.8.**

Q1.

INPUT

# To Determine the bearing capacity of soil with water table

BulkDensity =float(input("Enter the value of Bulk Density of soil:"))

SatDensity = float(input("Enter the value of Saturated Density of soil:")) WaterDensity = float(input("Enter the unit Weight of Water:"))

Df= float(input("Enter the value of depth of footing:"))

Dw = float(input("Enter the value of water table above footing level:"))

Dw1= float(input("Enter the value of Water table below the level of footing:")) B = float(input("Enter the value of width of footing:"))

Nq= float(input("Enter the value of Nq:"))

N = float(input("Enter the value of N gamma (N):")) SubDensity = 0 # You need to assign a value to SubDensity SatDensity = 0 # You need to assign a value to SatDensity

WaterDensity = 0 # You need to assign a value to WaterDensity print ("Submerged Weight of soil is:", SubDensity)

# The bearing capacity of soil when water table is at ground print ("CASE A")

qu= (SubDensity\* Df\*Nq) + (0.5\*0.8\*B\*SubDensity\*N) # Changed Ng to Nq print ("The value of ultimate bearing capacity of soil is:", qu)

# Approximate calculation of Bearing capacity of soil is. Rw= 0.5 + 0.5\*(Dw/B)

print ("The value of Rw is:", Rw) Rw1 = 0.5 + 0.5\*(Dw1/8)

print ("The value of Rw1 is:", Rw1)

qu= (BulkDensity\*Df\*Nq\*Rw) + (0.5\*0.8\*3\*BulkDensity \*N\*Rw1) # Changed Ng to Nq print ("The value ultimate bearing capacity of soil is:", qu)

# Case B

print ("CASE B")

qu= (BulkDensity \* Df\*Nq) + (0.5\*0.8\*8\*SubDensity) # This line has a syntax error, it's unclear what the intended calculation is.

print ("The value of ultimate bearing capacity is:", qu)

Dw = float(input("Enter the value of water table above footing level:"))

Dwl = float(input("Enter the value of Water table below the level of footing: ")) print ("The approximate value of ultimate bearing capacity is: ")

Rw = 0.5 + 0.5\*(Dw/B)

print ("The value of Rw is:", Rw) Rw1= 0.5 + 0.5\* (Dw1/8)

print ("The value of Rw1 is:", Rw1)

qu= (BulkDensity \* Df \* Nq \* Rw) / (0.5 + 0.8\*8\*BulkDensity \* Rw1) # Changed Ng to Nq and corrected NR1 to Rw1

print ("The approximate value of ultimate hearing capacity is: ", qu) # Case C

print ("CASE C")

x = float(input("Enter the value of depth of water below footing:"))

# Assuming you have defined BulkDensity, SubDensity, B, and N elsewhere

qu = (BulkDensity \* Nq) + (0.5 \* 0.8 \* ((BulkDensity \* x) + (SubDensity \* (B - x)) \* N)) #

Changed Ng to Nq

print ("The value of ultimate bearing capacity is:", qu)

Dw = float(input("Enter the value of water table above footing level:"))

Dw1= float(input("Enter the value of Water table below the level of footing:")) print ("The approximate value of ultimate bearing capacity is:")

Rw= 8.5+ 8.5\*(Dw/B)

print ("The value of Rw is:", Rw) Rw1 = 0.5 + 0.5\*(Dw1/8)

print ("The value of Rwl is: ", Rw1)

qu= (BulkDensity \* Df \* Nq \* Rw) + (0.5\*0.8\*8\*BulkDensity\*N\*Rw1) # Changed Ng to Nq and corrected the typo Bulk\_Density to BulkDensity

print ("the value of ultimate bearing capaciy is:", qu)

OUTPUT

Enter the value of Bulk Density of soil:18

Enter the value of Saturated Density of soil:20 Enter the unit Weight of Water:10

Enter the value of depth of footing:2

Enter the value of water table above footing level:0

Enter the value of Water table below the level of footing:0 Enter the value of width of footing:3

Enter the value of Nq:33

Enter the value of N gamma (N):34 Submerged Weight of soil is: 0

CASE A

The value of ultimate bearing capacity of soil is: 0.0 The value of Rw is: 0.5

The value of Rw1 is: 0.5

The value ultimate bearing capacity of soil is: 961.2 CASE B

The value of ultimate bearing capacity is: 1188.0

Enter the value of water table above footing level:3

Enter the value of Water table below the level of footing: 0 The approximate value of ultimate bearing capacity is:

The value of Rw is: 1.0 The value of Rw1 is: 0.5

The approximate value of ultimate hearing capacity is: 20.44750430292599 CASE C

Enter the value of depth of water below footing:1 The value of ultimate bearing capacity is: 601.2

Enter the value of water table above footing level:3

Enter the value of Water table below the level of footing:1 The approximate value of ultimate bearing capacity is: The value of Rw is: 17.0

The value of Rwl is: 0.5625

the value of ultimate bearing capaciy is: 21297.6

Q2.

INPUT

# To find the ultimate load carring capacity of pile UCS = float(input("Enter the value of UCS of soil:")) Cu = UCS/2

B = float(input("Enter the value of dimension of pile:")) l=float(input("Enter the length of pile:"))

Alpha = float(input("Enter the value of adhesion factor:")) Nc= float(input("The value of Nc: "))

Ab = B\*B

print ("the Base area of footing is:", Ab)

As = 4\*B\*l

print ("The value of chohesion of soil is:", Cu)

Qpu = Cu\*Nc\*Ab print ("'Qpu:", Qpu) Qf = Alpha\*Cu\*As print ("Qf:", Qf)

Qu= Qpu + Qf

print ("the value of load carring capacity of pile is (Qu):", Qu)

OUTPUT:

Enter the value of UCS of soil:75

Enter the value of dimension of pile:0.45 Enter the length of pile:15

Enter the value of adhesion factor:0.8 The value of Nc: 9

the Base area of footing is: 0.2025 The value of chohesion of soil is: 37.5 'Qpu: 68.34375

Qf: 810.0

the value of load carring capacity of pile is (Qu): 878.34375

Q3. INPUT

# To Determine the bearing capacity of soil with water table

BulkDensity = float (input ("Enter the value of Bulk Density of soil:"))

SatDensity = float (input ("Enter the value of Saturated Density of soil:")) WaterDensity = float (input ("Enter the unit Weight of Water:"))

Df = float (input ("Enter the value of depth of footing:")) B = float (input ("Enter the value of width of footing:")) Ng = float (input ("Enter the value of Ng:"))

N\_Gamma = float (input ("Enter the value of N gamma (N):"))

SubDensity = SatDensity - WaterDensity

print ("Submerged Weight of soil is:", SubDensity)

M = int (input("Number of data values of Water table above footing level: ")) N = int (input("Number of data values of Water table below footing level: "))

Dw = []

Dw1 =[]

for i in range (1, M+1) :

print ("Enter the value of water table above footing level measured w.r.t. ground (Dw) : ")

Depth\_Dw = float (input ()) Dw.append (Depth\_Dw)

Rw = 0.5 + 0.5\* (Depth\_Dw/B) print ("The value of Rw is:", Rw) for j in range (1, N+1):

print ("Enter the value of water table above footing level measured w.r.t. ground (Dw1) : ")

Depth\_Dw1 = float (input()) # Fixed the variable name here

Dw1.append (Depth\_Dw1) # You probably meant to append to Dw1 here Rw1 = 0.5 + 0.5\*(Depth\_Dw1/B) # Removed the indent

print ("The value of Rw1 is:", Rw1) # Removed the indent

qu= (BulkDensity\*Df\*Ng\*Rw) + (0.5\*0.8\*B\*BulkDensity\*N\_Gamma\*Rw1) print ("'qu: ", qu, "kN/m^2"

OUTPUT

Enter the value of Bulk Density of soil:18

Enter the value of Saturated Density of soil:20 Enter the unit Weight of Water:10

Enter the value of depth of footing:2 Enter the value of width of footing:3 Enter the value of Ng:33

Enter the value of N gamma (N):34 Submerged Weight of soil is: 10.0

Number of data values of Water table above footing level: 3 Number of data values of Water table below footing level: 3

Enter the value of water table above footing level measured w.r.t. ground (Dw) : 0

The value of Rw is: 0.5

Enter the value of water table above footing level measured w.r.t. ground (Dw) : 1

The value of Rw is: 0.6666666666666666

Enter the value of water table above footing level measured w.r.t. ground (Dw) : 2

The value of Rw is: 0.8333333333333333

Enter the value of water table above footing level measured w.r.t. ground (Dw1) : 0

Enter the value of water table above footing level measured w.r.t. ground (Dw1) : 0

Enter the value of water table above footing level measured w.r.t. ground (Dw1) : 1

The value of Rw1 is: 0.6666666666666666 'qu: 1479.6 kN/m^2