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Name:→ Naseer-Muhammad

I.D :→ 7885

Section:→ 'A'

Subject:→ Geotechnical - engineering

Instructor:→ Sir Liaqat

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Q1):→

A):→ Name the force acting on dam. Explain any five of them in detail.?

(a)

Ans:→ Force actting on Dam:→

1):→ water pressure.

2):→ uplift pressure.

3):→ wave pressure.

4):→ silt pressure.

5):→ Ice pressure

6):→ self weight of the dam

7):→ Seismic force.

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①:→ Water pressure:→

water pressure (sometimes abbreviated to pwp) refers to the pressure of groundwater held within a soil or rock. in gaps b/w particles water pressure is vital in calculating the stress state in the ground soil mechanics, from terzaghi's expression for the effective stress of a soil.

2):→ Uplift pressure:→

→ uplift pressure which is also known as hydrostatic uplift, is an upward pressure applied to a structure that has potential to raise it relative to its surroundings it is the condition of greater pore water pressure than the overburden pressure of the structure.

3):→ Ice pressure:→

Fort - heaving pressure in soil the frost-heaving phenomenon in soil describes the volume expansion caused by the phase change of water in the soil into ice. The observable results of this phenomenon are the amount of frost heaving and the frost heaving pressure.

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4):→ Self weight of the dam:→

→ self weight of dam - major resisting force numerically.

⇒ Product of the volume and the specific weight of the material comprising the dam. for a dam cross section. It is calculated by dividing the c/s into several components of rectangles and triangles. Finding weight of each of the component and compounding.

5):→ Seismic Force:→

The seismic load is the inertia force on the structure and its magnitude and distribution on the structure continually change in time from the start of the vibration.

As a Phenomenon of dynamics, the seismic force therefore depends on the distribution of mass and stiffness throughout the Structure.

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Q1):→

B):→ Define the following terms.

1) Liquification of soil

2):→ Butress Dam (3):→ Infinite slope

4):→ Pier foundation (5):→ Dynamic load.

Ans:→ Liquification of Soil:→

A phenomenon where by a saturated or partially saturated soil substantially losses strength and stiffness in response to an applied stress usually earth quake shaking or other sudden change in stress condition caus it to behave like liquid

2):→ Butress Dam:→

A Butress Dam or hollow dam bassically a derivation of a gravity dam with the introduction of undermediate space.

→ with a butress dam. The face of the dam as held by a series of supports or butress that are place at intervals on the down stream side.

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3):→ Infinite Slop:→

A infinite slope is simply a vertical line. when you plot it on a line graph an infinite slope is any line which runs parrallel to y-axis.

→ you can also describe this as any line that doesnt move along the x-axis but stays ~~fixed~~ fixed at one constant x-axis coordinate making the change along the x-axis 0.

4):→ Pier foundation:→ A Pier foundation is a collection of large diameter cylinderical column to support the superstructure and tranfer large superexposed load is the form strala below. It stood several feet above the ground.

5):→ Dynamic Load:→

Dynamic load very in their magnitude, direction or position with time. The type of dynamic load in soil the foundation of a structure depend upon on the nature of the source produceing it.

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Q2:→ Define shallow foundation. explain types of shallow foundation in detail with sketch? Page(6)

A):→

Ans:→ Shallow foundation:→

According to Dr. Karl Terzaghi

"Foundation in which the depth of the foundation is less than the breath then such a foundation is termed as shallow foundation."

*):→ Types of shallow foundation:→

→ Shallow foundation is divided into the following main types.

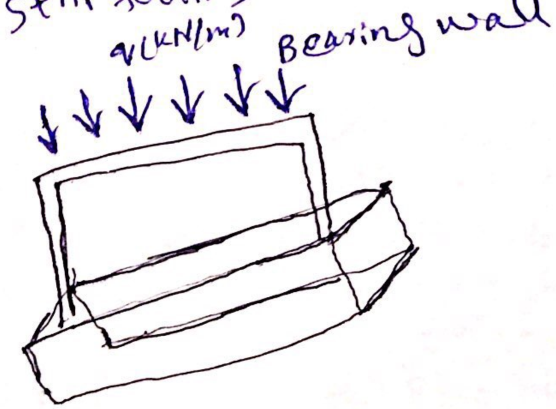
i):→ wall footing / strip footing (ii):→ combined footing

iii):→ mat / Raft footing iv) colum footing

V):→ Strapped footing

i):→ wall footing:→

wall footing is a footing which runs across the length of the footing



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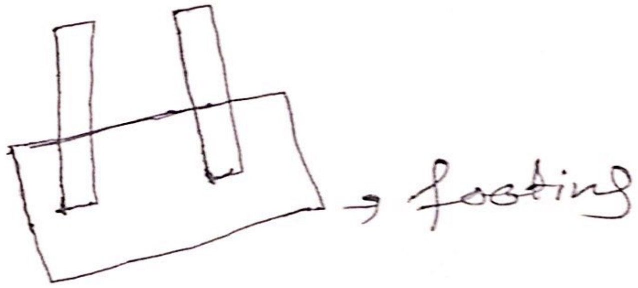
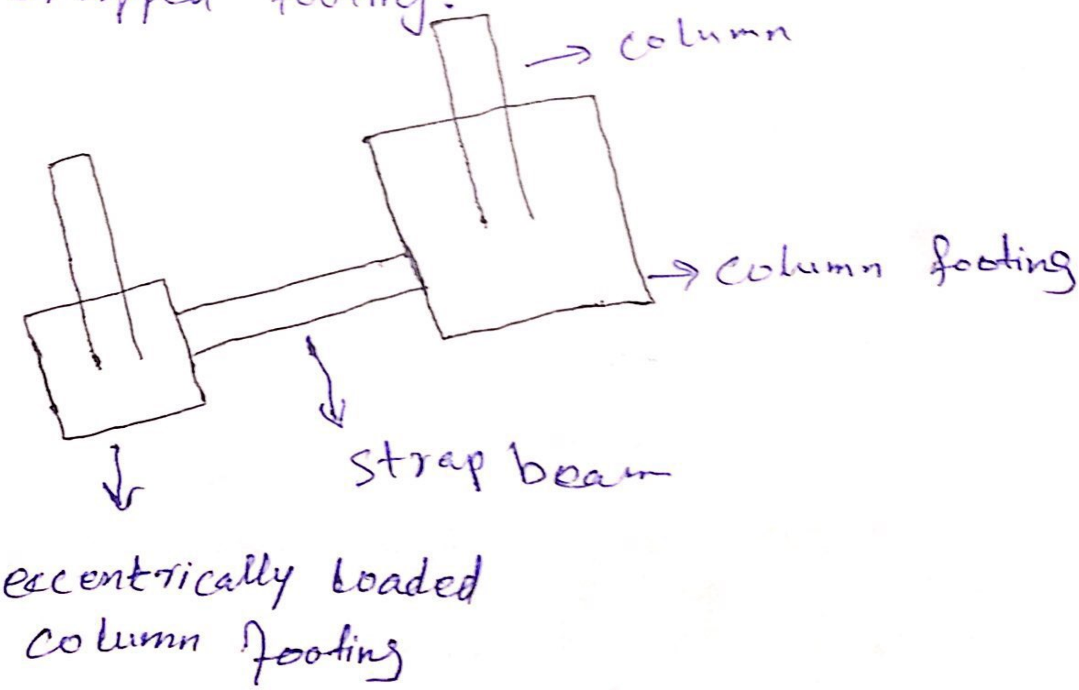
ii):→ Combined footing:→

footing which constructed combined for two or more columns to transfer the load of these columns ~~soil~~ safely to the soil then such footing is called combined footing.



iii):→ Strapped footing:→

footing in which the outer column is connected with the inner column by means of tie beam or strap such a footing is called strapped footing.



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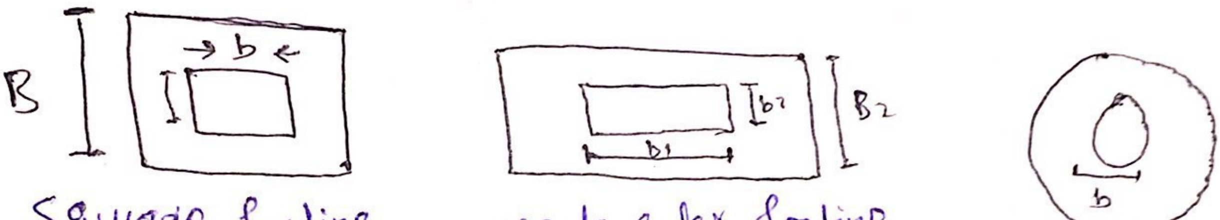
→ Column footing:→

for single column footing which is constructed to the soil and transfer its load safely is called column.

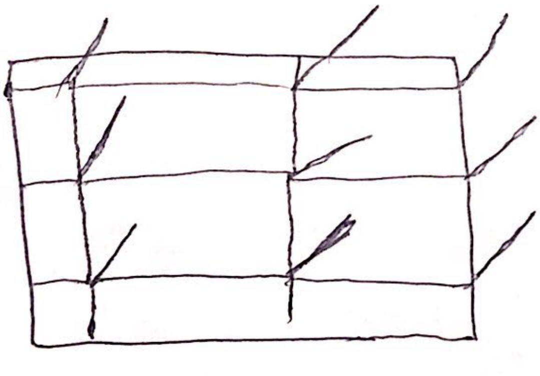
→ This column may be circuler, rectang or squre in shape



Square footing   rectangular footing   circular footing

vi):→ Raft / mat footing:→

Footing which is constructed and covers the area of the entire structure this type of footing is provided when the soil is weeks in bearing mean having week bearing capacity.



Q7:→

B):→ Why ground improvement techniques are important Explain five method of ground improvement in detail along with appropriate sketch?

B
Ans:→ Ground Improvement techniques:→

Ground improvement techniques are the techniques which are used to enhance the engineering property of soil in order to beal heavy structual load.

*1):→ Need of Ground Improvement techniques:→

→ The soil in which volumatric change take place due to shrinkage and swelling such soil needs ground improvement techniques.

→ The soil which is organic in nature.

→ The soft soil also required ground improvement techniques.

→ The soil which is sandy and grately.
The foundation is sanatory dump place also required ground improvement techniques

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*):→ Methods of Ground improvement techniques

1):→ Removal and Replacement of soil:→

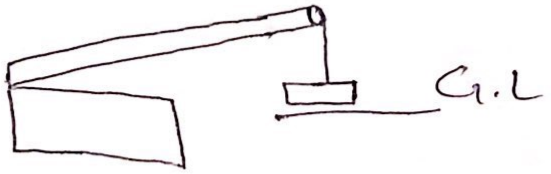
This is an oldest and simple method. This method is performed on loose soil.

→ In this method the unsuitable soil is replaced with compacted fill. In this method the same soil is used to refil the hiegher compaction and batter engineering properties.

→ This method is applicable above the ground water table

2):→ Dynamic compaction:→

This method is used to increase the bealing capacity of soil. This also increase the consolidation rate. this method also increase the density of soil. In this method octually densification of soil take place.



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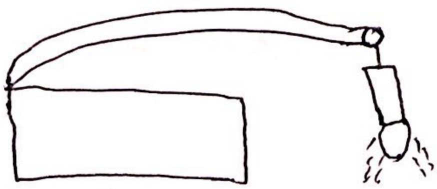
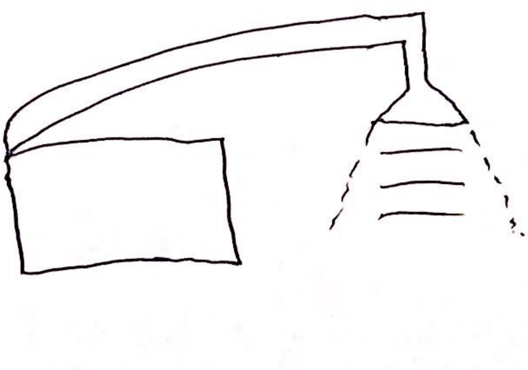
3):→ Vibro compaction:→
It is also called vibro densification. In this method the compaction take place at a certain depth in granulal soil through vibratory probe is run by an electric motor. The penetration of probe is enhance by ejecting water at the tip of probe



4):→ Rapid impact compaction:→
Impact energy is applied to ~~surface~~ surface of ground as a result of which densification of soil take place upto a depth of 15 feet.

This impact energy is actually applied through hydraulic jump. The hydraulic jump weight values from 4–8 tons.



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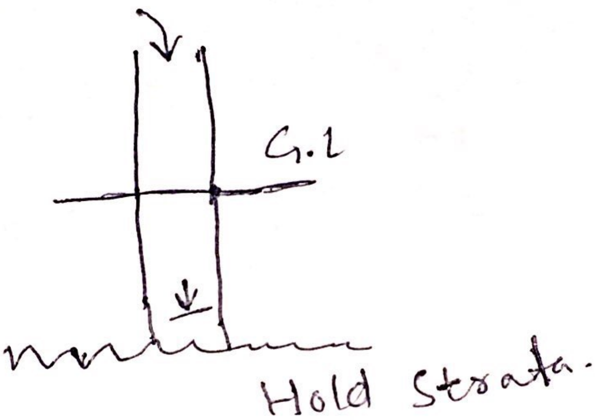
5):→ Vibro concrete column:→

Vibro concrete columns is a ground improvement technique which tranfers the load from weak Strata to hold strata by using strength concrete



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Q3 :→

Ans

Given Data

$C = 25 \, kN/m^2$

$\phi = 16^\circ$

$G = 2.72$

$e = 0.50$

Required ?

Fc (F.O.S) when soil is dry.

Fc (F.O.S) when there is seepage in soil.

Sol :→

$$F_c = \frac{c}{\gamma d \times H \times \sin i \times \cos i} + \frac{\tan\phi}{\tan i}$$

$$\gamma d = \frac{G_s \times \gamma_w}{1+e} = \frac{2.72 \times 9.8}{1+0.5}$$

$$\gamma d = 17.8 \, kN/m^3$$

$$F_c = \frac{25}{17.8 \times 6 \times \sin(26^\circ) \times \cos(26^\circ)} + \frac{\tan(16^\circ)}{\tan(26^\circ)}$$

$$F_c = 1.8$$

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When there is seepage of water.

$$F_c = \frac{c}{\gamma \times H \times \sin i \times \cos i} + \frac{\gamma'}{\gamma} + \frac{\tan\phi}{\tan i}$$

$$\gamma' = \gamma - \gamma_w$$

$$\gamma = \frac{G+e}{1+e} \times \gamma_w$$

$$\gamma = \frac{2.72+0.5}{1+0.5} \times 9.8$$

$$\gamma = 21.04 \ kN/m^3$$

$$\gamma' = \gamma - \gamma_w$$

$$\gamma' = 21.04 - 9.8$$

$$\gamma' = 11.24 \ kN/m^3$$

$$F_c = \frac{25}{21.04 \times 6 \times \sin(26^\circ) \times \cos(26^\circ)} + \frac{11.24}{21.04} + \frac{\tan(16^\circ)}{\tan(26^\circ)}$$

$$F_c = 0.816$$

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Q4):→

A):→

Ans:→

Given Data

Height = 10m

$C = 18.8\ KN/m^2$

$\gamma = 17\ KN/m^2$

$\phi = 20^\circ$

F.O.S = 1.5

$F\phi = 1.0$

Required ?

inclination, $i = ?$

Sol =

$$SN = \frac{C}{F.O.S \times \gamma \times H}$$

$$SN = \frac{18.8}{1.5 \times 17 \times 10}$$

SN = 0.73

using taylor chart for

$\phi = 20^\circ$

SN = 0.073

$i = 44^\circ$

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Q4

B) :→

<u>Ans</u> :→ Given Data

Height of water on upstream side = 18 m

Bottom width of the dam = 12 m

Top width = 6 m

unit weight of water = 1000 kg/m³

unit weight of concrete = 1450 kg/m³

unit weight of silt = 1330 kg/m³

Angle of friction for silt = ϕ_s = 35°

Free Board = 3.5 m

Silt Deposite height = 2.5

Required

silt pressure = ?

<u>Sol</u> :→ As we know that

$$P_s = \frac{\gamma_s - H_s^2}{2} \times \frac{1 - \sin\phi}{1 + \sin\phi}$$

$$P_s = \frac{1330 \times (2.5)^2}{2} \times \frac{1 - \sin 35^\circ}{1 + \sin 35^\circ}$$

$$P_s = 1126.30 \text{ kg/m}$$

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