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Section	"A"
Semester	6th
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Subject	Geotech Engineering
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Q:01 (a) Name the force Acting on Dam Explain any five of them?

Force Acting on Dam:-

1) Water pressure
2) Uplift pressure
3) Earth Quick Force
4) Silt pressure
5) Wave pressure
6) Ice pressure
7) Weight of Dam

1) =) Water pressure:-

Water pressure is on of the mass major external force acting on dam The horizental water pressure exerted by the water stored on upstream side of dam can be collected from hydrostatic pressure distribution

2) Uplift pressure:-

Water seeping through to the pores and fissures of the foundation material and water seeping through the dam of the body and there to the bottom through the joint between the body of the dam

3) Silt pressure:-

if "h" is the height of silt deposited then force exerted by the silt in addition to external water pressure can be represented by Rankine formula

$P_{silt} = \frac{1}{2} \gamma_{sub} h^2 K_a$ and its acts at h/3 frome base

Where $K_a = 1 - \sin\phi / 1 + \sin\phi$

γ_{sub} = Submerged Unit weight of Silt material

h = height of silt deposit.

4) Ice pressure :-

The ice which may be formed on the water surface of the reservoir in cold countries may some time melt and expand. The dam force then has to resist force exerted by the expanding ice this force act linerly along the length of the dam @ and it the reservioar level the magnitude of this force varies from 250 – 1500 kn/m²

Weight of Dam :-

The weight of Dam body and its foundation is the major resisting force in two diamensional analysis of the gravity dam unit length of dam is considered, the c/s then can be divide into rectangle and Traingle.

Q#02 (b) Defination of Term

1) **Liquification of soil:-**

Effective stress are those stresses which keep the soil partical in contact with each other. if the effective stress decrease the soil loose its strength and when the effective stresses become zero then the soil is changed to liquified state this phenomena is called Liquifaction of soil

2) **Butress Dam:-**

its is the type of dam that ~~const~~ consist of water retaining sloping member that is supported by a series of build resses at right angle to the axis of the dam.

3) Infinite slope:-

⇒ infinite slope is a term used to Designate a constant slope of infinite slope

⇒ its is the slope which have infinite area and finite depth

The boundarie of these slope are not well ~~design~~ defined

4) Pier Foundation:-

it is a type of deep foundation that consist of cylindical column of large diameter to support and transmit large super imposed loads to firm strata below

5) Dynamic Load:-

⇒ Dynamic Load is a type of load that varry in their magnitude, direction or position with time

⇒ These are time dependent Loads.

⇒ The type of dynamic Loading in soil or the foundation of a structure

Q#2 (a)

Shallow Foundation:-

According To Terzaghi:-

The foundation in which depth of the foundation is less or equal to width of the foundation is called Shallow foundation

$$Df \leq B$$

According To Skempton:-

The foundation in which Df/B ratio is less then or equal to 2.5 then the foundation is called Shallow foundation

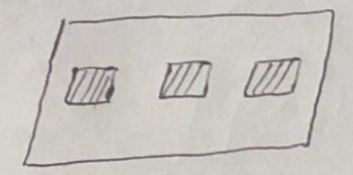
Type of shallow foundation:-

1) Wall Footing:-

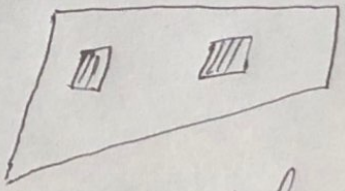
The footing which runs accross the length of the wall and transfer the load of the wall to the soil safely it is called wall footing

2) Combined Footing:-

The footing which constructed for two or more ~~coto~~ column and transfer the load of the two or more column to the soil safely then it is called combined footing



Rectangular



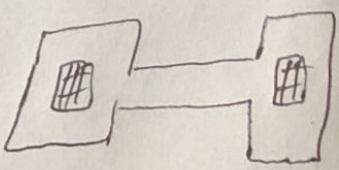
Trapezoidal

3) Raft Footing:-

The footing which cover the whole area of the structure is called raft footing

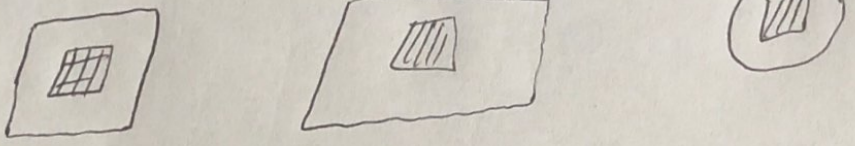
4) Strapped Footing:-

The footing in which the outer column is connected with the inner column by mean of beam or strap is called strapped footing



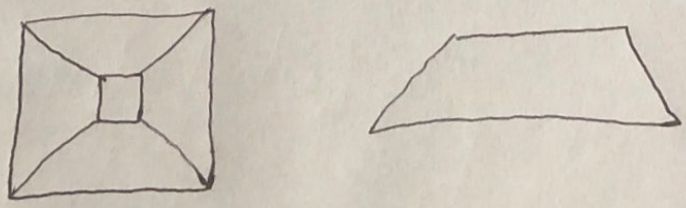
5) Column / Isolated Footing:-

The footing which is constructed for a single column and transmit its load to the soil safely it may be circular, square or rectangular in shape



6) Slopped Footing:-

The footing which have slope in all direction or in all sides is called as slooped footing



Q#02
(b)

Ground Improvement Techniques:-

Ground improvement techiques are Those which are Used to enhance The engineering property of soil in order to heavy structure load

Why Ground Improvement Technique are Importance:-

The Soil in which volumetric change take place due to shrinkage ~~such~~ and Swelling Such soil need ground improvement techenique

-) The soil which is organic in nature
-) The soft soil also ground improvement technique.

Method of Ground improvement Technique:-

1) Removel and Replacement of soil:-
This is The oldest and simple method This method is performed on loose soil.

In this method the unstable soil is replaced with compacted fill In this method the same soil is used to refill the higher compaction and better engineering properties

2) Wet soil mixing:-

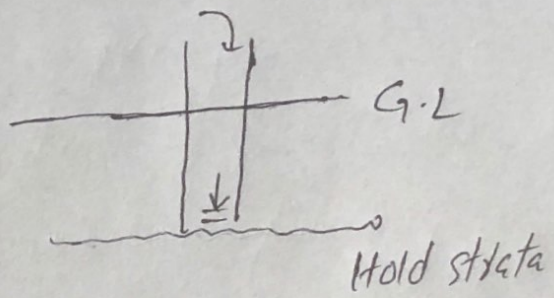
In this method of ground improvement technique a paste of cement is prepared and inserted in the soil this method is used to improve the characteristic of week soil

3) Dry mixing of soil:-

Dry mixing of soil is ground improvement technique by which the characteristic of weak soil are improved by using dry cementitious binder.

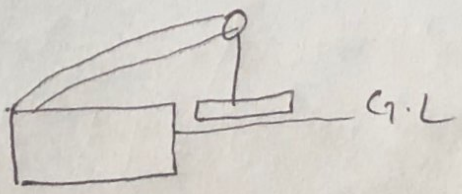
4) Vibro concrete column:-

Vibro concrete colume is the ground improvement technique which to transfer the load from weak strata to hard strata by using strength concrete



5) Dynamic compaction:-

This method is used to increase the bearing capacity of soil also increase the consolidation rate, this method also increase the density of soil



Q:03 **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.

Solution:-

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

$$\Rightarrow \gamma d = \frac{Gs \times \gamma w}{1+e} = \frac{2.72 \times 9.8}{1+0.5}$$

$$\gamma d = 17.8\ KN/m^3$$

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

$$\Rightarrow \boxed{Fc = 1.18}$$

When There is Seepage of Water

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

$$\gamma' = \gamma - \gamma w$$

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

$$\Rightarrow \boxed{\gamma = 21.04 \text{ kN/m}^3}$$

$$\gamma' = \gamma - \gamma w$$

$$= 21.04 - 9.8$$

$$\Rightarrow \boxed{\gamma' = 11.24 \text{ kN/m}^3}$$

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

$$\Rightarrow \boxed{Fc = 0.816}$$

Q#4 (9)

Given Data :-

Height, $H = 10m$

$C = 18.8 kN/m^2$

$\gamma = 17 kN/m^3$

$\phi = 20^\circ$

$F.O.S = 1.5$

$F\phi = 1.0$

Required :-

Inclination, $i^\circ = ?$

Solution :-

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

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

$$\Rightarrow \boxed{SN = 0.073}$$

Using taylor chart 70

$\phi = 20^\circ$, $SN = 0.73$ $\quad i^\circ = 0.44$

Q:4 (b) Given Data:-

Height of Water on upstream side = 15m

Bottom width of the Dam = 12m

Top width = 6m

Unit weight of water = $1000 kg/m^3$

Unit weight of concrete = $1450 kg/m^3$

" " of silt = $1330 kg/m^3$

Angle of friction for silt : $\phi_s = 35^\circ$

Free Board = 3.5m

Silt Deposite height = 2.5m

Requirment:-

Silt Pressure = ?

Solution:-

As we know that

$$P_S = \frac{\gamma_S \times H_S^2}{2} \times \frac{1-\sin\phi}{1+\sin\phi}$$

$$P_S = \frac{13.30 \times (2.5)^2}{2} \times \frac{1-\sin(35^\circ)}{1+\sin(35^\circ)}$$

$$\Rightarrow \boxed{P_S = 1126.30 \text{ kg/m}}$$