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Section:- "A"

Q No! 1:. part- A

Ans!- Force acting on dam :-

forces acting on a dam are as follow:

1- water pressure
2- weight of the dam
3- ice pressure
4- wave pressure
5- Earth quack pressure
6- wind pressure
7- silt pressure
8- uplift pressure
9- thermal loads.

i- Water pressure :-

Water pressure (P)
is the most major external forces acting on dam.

The horizontal water pressure exerted by the weight of the water stored on the upstream side of the dam.

⇒ The water pressure can be calculated by hydrostatic pressure distribution.

⇒ force due to water pressure

$$P = wH^2/2$$

⇒ This act at a height of 1/3 from base of the dam.

2 - uplift pressure :-

⇒ It is almost impossible to make a dam on previous structure.

⇒ many minute cracks and pores are left in the dam and the foundation body

⇒ water is likely to find its way into those minute openning through seepage and

gradually fill them up.

⇒ It exerts and an upward pressure on the body of the dam.

3- Earth quake forces:-

⇒ The disturbance in dam is highly dangerous because they store huge volume of water.

⇒ Dams built in the area known to be seismically active must be designed to with stand additional forces that are likely to arise in future Shock.

4- Wave pressure:

⇒ The upper portions of dam are subject to the impact of waves.

⇒ wave pressure against massive dams of appreciable height is usually of little consequence.

⇒ The force and dimension of waves depends

mainly on the extend and configuration of the water surface. the velocity of wind.

5- Ice pressure :-

The ice pressure which may be formed on the surface of the reservior in cold countries may sometime melt & expend.

⇒ The dam face has then to resist the thrust exerted by the expanding ice.

This force acts linearly along the length of the dam & at the reservior level.

The magnitude of the force varies from 250 to 1500 kn/m² depending upon the temperature variation on an average a value of 500 kn/m² may be allowed under ordinary condition.

Q No. 01 part # B.

1- Liquification of Soil :-

" A phenomenon whereby a saturated or partially saturated soil substantially loses strength and stiffness in response to an applied stress. Usually earthquake shaking or sudden change in stress condition causing it to behave like a liquid " is called soil liquefaction.

Liquefaction of soil is the process that leads to a soil suddenly losing strength most commonly as a result of ground shaking during a large earthquake.

2- Buttress Dam :-

* A Buttress dam is define as:

A dam consisting of relatively thin water supporting facing or deck supported by buttress generally in the form of equally spaced triangular walls or counter forts that transmit the water load and deck weight to the foundations.

3- Infinite slope :-

Slope which have great extent with uniform soil condition at any point given depth below the surface.

The soil stratum is not necessary homogenous with the depth but the strata of different soil are parallel to the slope surface.

4- Pier foundation :-

A pier foundation consists of a cylindrical column of large diameter to support

and transfer large super-imposed loads to the firm strata below, through pile foundations transfer the load through friction and/or bearing, pier foundations tranfer the load only through bearing.

5- Dynamic load:-

The load which act on ground by the movement of the sujects and sometime the load due to earthquake can be classificied as dynamic load.

Q NO! 02 part- A

Ans:- **Shallow Foundations:-**

According to Terazghi:

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

$D_f \leq B$.

According to skemptions:-

The foundation is which Df/B ration is less than or equal to 2.5 than the foundation is called shallow foundation.

Types of Shallow Foundation:

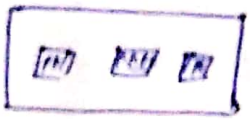
1 - Wall footing :-

The footing which runs across the length of the wall and transfer the load of the wall to the soil safely. it is called wall or strip footing.

2 - Combined footing :-

The footing which is constructed for two or more column and transfer the load of the two or more column to the soil safely then it is called combinted footing will be rectangular in shape.

if the load of the column is uniform then shape of combined footing will be trapezoidal.



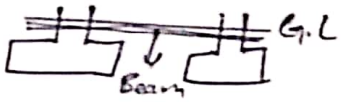
Rectangular

Trapezoidal

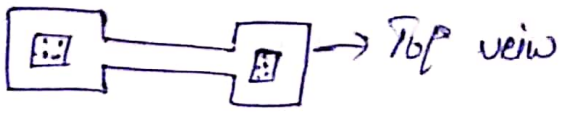
3. Raft/mat footing :-

The footing which covers the whole area of the structure is called raft footing. This type of footing is proposed in area which have soil weak in bearing capacity. This is also provided when the load of soper structure is heavy.

4- Strapped footing :-



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

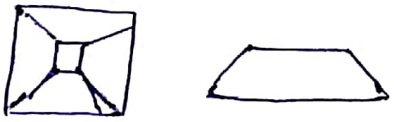


5- Coulumn/Isolated footing :

The footing in which is constructed for a single column and transmit the loadg to the soil safely it may be circular, squace, rectangular in shape.

6- Scopped footing :-

The footing which have slope in all direction as in all sides is called as sloppe footing:



Q No! 02 part-B

Ans:- Ground improvement technique are Important!:

The soil in which volumetric changes take place dece to shrinkage and swelling such soil needs ground improvement techniques.

- The soil which is organic in nature.
- The saft soil also required ground improvement techniques.
- The soil which is sandy and gravely.

The foundation is sanatory dump places also required ground improvement techniques.

Methods of Ground Improvment Techniques:

i- 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 refill the higher compacting and better engineering properties. This method is applicable above the ground water table.

2. Dynamic Compaction :-

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

In this method aatually densification of soil take place.

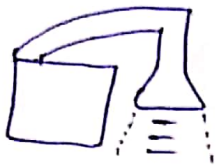
3- VIBRO Compaction:-

It is also called vibro densification. In this method the Compaction take place at a certain depth in granular soil through vibratory probe. This vibratory probe is run by an electric meter. The penetration of probe is exchange by ejecting water at the tip of probe

4- Rapid Impact Compaction:

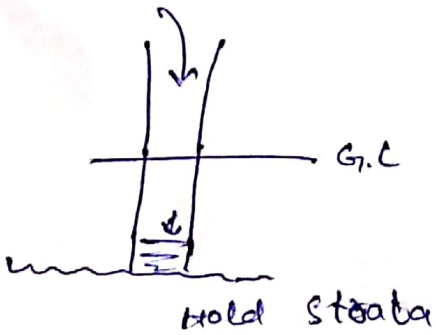
Impact energy is applied to surface of ground as a result of which desification of soil takeplace upto depth of 15 feet. This impact energy is actually applied

Through hydraulic ramp. The hydraulic ramp weight values from 4-8 tons.



5- VIBRO Concrete Column:.

Vibro Concrete Columns is a Ground Improvement technique which transfer the load from weak Strata to hold Strata by using Strength Concrete.



Q NO! 03

Given data!

$C = 25\ KN/m^2$

$\phi = 18°$

$G = 2.72$

$e = 0.50$

Required F_c (F.O.S) when soil is dry

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

Solution:-

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

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

$$F_c = \frac{25}{17.8 \times 6 \times \sin(26°) \times \cos(26°)} + \frac{\tan(18°)}{\tan(26°)} = F_c = 1.18$$

$$Fc = 1.18$$

When There is seepage of water.

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

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

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

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

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

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

$$= 21.04 - 98$$

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

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

$$\boxed{Fc = 0.816}$$

Q NO: 04 Part-A

Given data:

- Height = H = 10m
- C = 18.8 Kn/m²
- γ = 17 Kn/m³
- θ = 20°
- F.O.S = 1.5
- F_θ = 1.0

Required :- Inclination i = ?

Solution:- $S_n = \frac{C}{F.O.S \times \gamma \times H}$

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

$S_N = 0.073$

Using Taylor chart for

$\phi = 20^{\circ}$

$S_N = 0.073$

Then

$\boxed{i = 44}$ (from Taylor chart)

Q No: 04 Part - B :

Given data :

* Hieght of water on upstream side = 15 m
* Bottom width of the dam = 12 m
* Top width = 6 m
* Unit weight of water = 1000 kg/m^3
* Unit weight of concrete = 1450 kg/m^3
* Unit weight of salt = 1330 kg/m^3
* Angle of friction for silt : $\theta_s = 35°$
* Free Board = 3.5 m
* Silt Deprite height = 2.5 m

Required :- Silt pressure :?

Solution :- As we know that .

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

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

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

The End of Paper.