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Section :- "B"

Subject :- Geo-tech Engineering

Program :- B.Sc Civil Engineering

Semester :- "Six"

Q No 1 (a)

Ans:- **Force Acting On Dam:-**

Force acting on dam are as follow.

- → Water Pressure.
- → weight of the dam.
- → ice Pressure.
- → Wave Pressure
- → Earth quake Pressure
- → Wind Pressure
- → Silt Pressure
- uplift Pressure.
- Thermal loads

Water Pressure:-

→ Water Pressure (P) is the most major external force acting a 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 between from base of a dam

⇒ Uplift Pressure :-

→ It is almost impossible to make a dam structure.

→ Many minute cracks and pores are left in the dam the foundation body

→ water is likely to find its way into these minute opening through seepage and gradually fill them up.

It exert an upward pressure on the body of the dam.

→ **Earth quake force:-**

→ The disturbance is dam is highely dangerous because they storage huge volume of water.

- Dam built in the area know to be Scismically acting must be designed to with stand additional forces that are likely to arise in a future shock.

→ **Wave Pressure:-**

→ The upper Portion of dam are subject to the impact of water.

→ Wave pressure against massive dams of appreciate height usally of little Consequence.

The force and dimension of waves depend mainly to the extent and Configuration of the water Surface, the velocity of wind.

→ **Ice Pressure:-**

The ice Pressure may be formed on the Surface of the reservoir in Cold Countries may Some time melt and expand.

→ **uplift Pressure:-**

→ It is almost impossible to made a dam Structure

Q.No 1 (B)

Ans:- **Pier Foundation :-**

A Pier foundation Consists of a cylindrical column a large diameter to support and transfer large Supr-imposed loads to the firm strata below though pile foundation transfer the load through friction and/or bearing, Pier foundation transfer the load only through bearing.

→ **Infinte Slope :-**

- Slope which have great extend with uniform soil Conditions at any given depth below the Surface.
- The Soil Stratum is not necessary homogenous with depth

but the Strata of different Soil are parallel to the Slope Surface.

→ **Buttress Dam:-**

• A butters dam is defined as a dam Consisting of a relatively thin water Supporting facing or deck Support by butters generally in the form of equally spaced triangular walls or Counter forts that transmit the water load and deck weight to the foundations.

→ **Liquification Of Soil:-**

- The Phenomenon whereby a Saturated or partially Saturated Soil Substantially loses Strength and Stiffness in response

to an applied stress, , usally earthquake shaking or other sudden change in stress condition. Causing it to behave like a liquid" is called soil liquification.

Dynamic Load :-

The loads which acts on ground by the movement of subjects and sometimes the load due to earthquake can be classified as dynamic load.

QNO2
(A)

Ans:- SHAllow Foundation:-

- According to Terzaghi:- The foundation in which the depth of the foundation is less or equal to width of the foundation is called shallow foundation

$D_f \leq B$

-According to Skemption:- The foundation in which D_f/B ratio is less than or equal to 2.5 than the foundation is called shallow foundation

Types Of SHallow Foundation:-

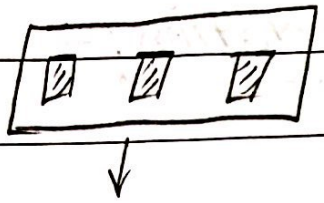
1:- Wall / Strip Footing :-

The footing which runs across the length of the wall and transfer the load of the wall or strip footing.

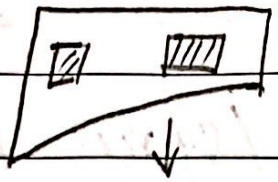
2) Combined Footing:-

The footing which is Constructed for two or more Column and transfer the load of the two as more column to the Soil Safely then it is Called Combined footing.

If the load of Column is uniform then the combined footing will be rectangular in shape.



Rectangular

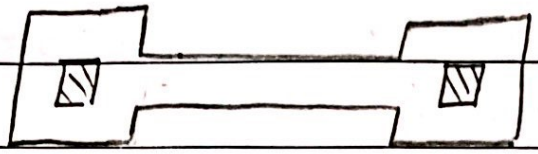


Trapzoidal

3) Raft/MAT Footing :- The footing which covers the whole area of the structure is called raft footing. This types of footing is proposed in area which have soil weak in bearing capacity. This is also provided when the load of super 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.

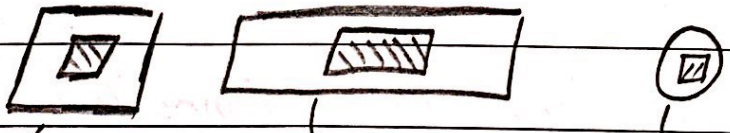


→ Top view

5) Column / Isolated Footing :-

The footing which is Constructed for a Single Column and transmit its load to the Soil Safely.

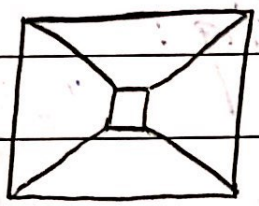
It may be Circular, Square rectangular in Shape.

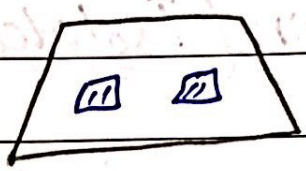


Square. Rectangle Circular

6. Slopped Footing :-

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





Selection Of Foundation :-

Selection of foundation depend upon the following.

1. Types of soil and condition of soil
2) It depend upon the load of super structure.
3) The depth at which the safe bearing capacity exsist.

Priority To Shallow Foundation :-

For the construction of a Structure the Priority will be given to the Shallow. Foundation because

1. The Shallow Foundation is economical as Compared to deep Foundation
2) The Shallow Foundation is easy in deep Foundation.

Q No 2 (B)

Ans - ## Ground Improvement Tecniques :-

Ground Improvement tecniques are the tecniques which are used to enhance the engineering property of soil in order to bear heavy structural load.

The main properties are Sheal Strength, permeability, bearing capacity and stiffness etc

Methods of Ground Improvement Techniques.

1:- ### Removal And Replacement Of Soil:-

This is an oldest and simple method.

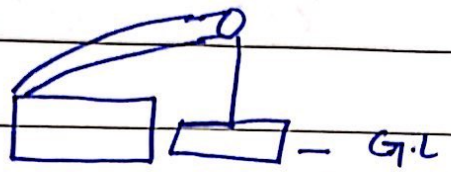
This method is performed on loose soil.

In this method the unsuitable soil is replaced with compacted fill. In this method the same soil is used to refill the higher compaction and settler engineering properties.

This method is applicable above the ground water table.

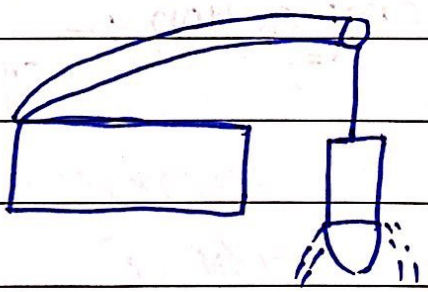
2 Dynamic Compaction :-

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



3. Vibro Compaction :-

It is also Called densification. In this method the Compaction. take place at a Certain depth in gradual Soil through vibratory probe. This vibratory. The Penetration of Probe is enhance by ejecting water at the tip of probe.

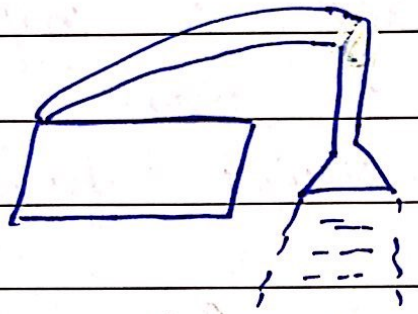


4:- Rabid Impact Compaction :-

Impact energy is applied to Surface of ground as a result of which

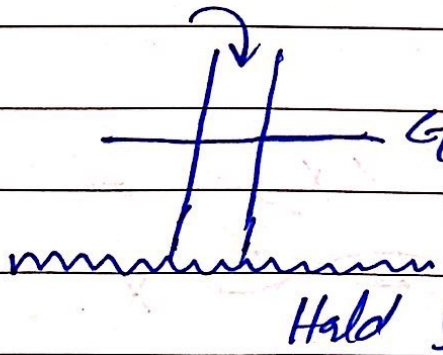
densification of soil take place upto a depth of 15 feet.

This impact energy is actually applied through hydraulic ramp. The hydraulic ramp weight valves from 4-8 tons



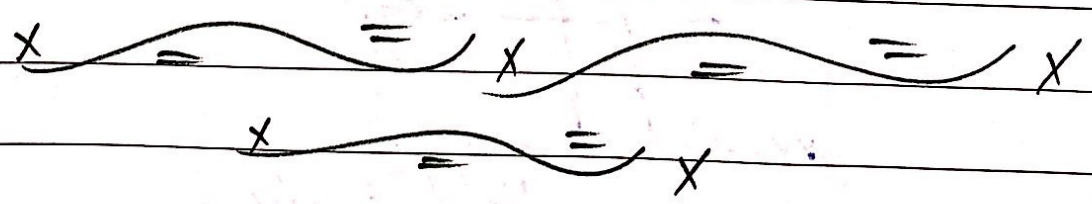
5- Vibro Concrete Column:-

Vibro Concrete Columns is a ground improvement technique Strata to hold Strata by using Strength Concrete.



6. **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 characteristics of weak Soil by using Cementitious binder slully.

7 **Dry Mixing of Soil:-** Dry Soil mixing is ground improvement technique by which the characteristics of weak soil are improved by using dry Cementitious binder.



QNo3

Ans:-

Given data:-

$C = 25 KN/m^2$

$\phi = 16^\circ$

$G_s = 2.73$

$e = 0.50$

Required:-

F.O.S when Soil is dry = ?

F.O.S when there is seepage = ?

Solution:-

Using formula.

$$F_c = \frac{C}{\gamma_d \times t \times \sin i \times \cos i} + \frac{\tan \phi}{\tan i}$$

By Relation

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

$\gamma_d = 17.8 KN/m^3$

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

$$\boxed{F_c = 1.18}$$

When there is Seepage Of Water.

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

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

$$= 21.04 \ KN/m^2$$

$\gamma' = \gamma - \gamma_w \Rightarrow 21.04 - 9.8$

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

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

$$\boxed{F_c = 0.816}$$

Result:- Fc when soil is dry = 1.18

Fc when there is Seepage = 0.816.

Q No 4 (a)

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, $i = ?$

Solution:-

using formula

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

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

$$S_N = 0.73$$

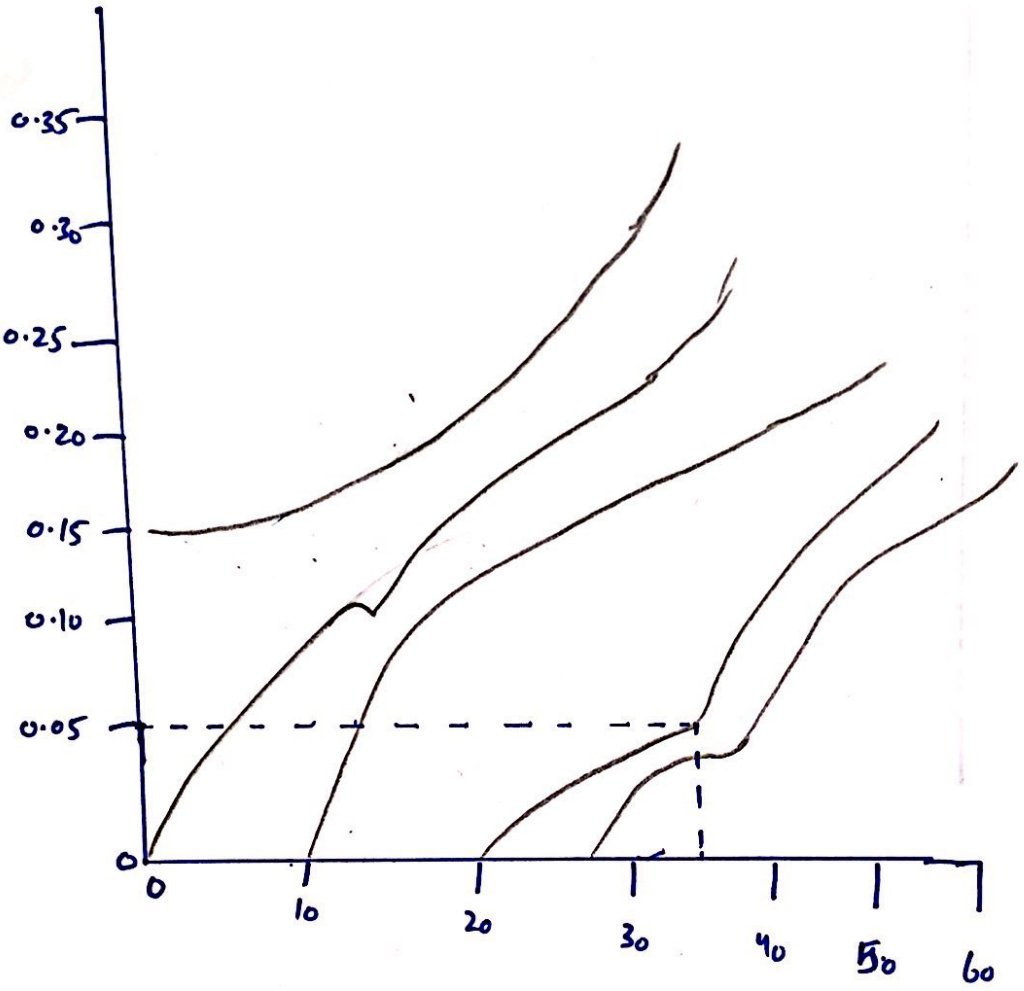
using taylor chart for

$\phi = 20^\circ$

$S_N = 0.073$

$$\boxed{i = 44^\circ}$$

Ans


0·35
0·30
0·25
0·20
0·15
0·10
0·05
0
0
10
20
30
40
50
60
Slope Angle

Q No 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/m²
* unit weight of Concrete = 1450 kg/m²
* unit weight of Salt = 1330 kg/m²
* Angle of friction for silt = $\theta_s = 35^\circ$
* Free Board = 3.5m
* Silt Deposite height = 2.5m

Required:- Silt Pressure = ?

Solution:-

As we know that

$$P_s = \frac{\gamma_s \times H_3^2}{2} \times \frac{1 - \sin\theta}{1 - \sin\theta}$$

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

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