Name	Shahkar
ID	7808
Subject	geotechnical & foundation Engineering
Semester	6th
Submitted to	Engr Liqat ali
program	BE (civil)
Date	27-06-2020

Question NO 1 (A)

* Name the forces acting on Dam?

Ans 1= **Water pressure:**

This is the major external forces acting on dam.

Pressure component on both upstream and down stream are

1- Vertical component
2- Horizontal component

unitweight of water $\gamma_w = 1000 kg/m^3$

2) **uplift pressure OR (Seapage load).**

when the water is stored on the upstream side of a dam there exists a head of water equal to the height up to which the water is stored. This water enters the pores, fissures, and crack of the foundation material under pressure. It also enter the joint b/w the dam and the foundation at the base and pores of dam itself.

3) Earth quake forces:

Earth quake produce waves in every possible direction. it has to be resolved in to vertical and horizontal components for the design purposes. The horizontal component has greater effect.

4) Self weight of Dam:

The weight of dam and its foundation is a major resisting force. It can be computed using the following equation

$$W = \gamma_m \text{ volume}$$

where

γ_m = unit weight of dam material

5) Silt pressure:

The weight of dam and its foundation is a major resisting force. It act h/3 from the base and can be computed using equation

$$P_{silt} = 0.5 \gamma_s h^2 K_a$$

6) Wave pressure:

waves are generated on the surface of the reserviour by the blowing winds, which exert a pressure on the upper part of the dam above the water level.

7) Ice pressure:-

The ice which may be formed on the water surface of the reservoir in cold countries may sometimes melt and expand. The dam face is subjected to the thrust and exerted by the expanding ice. This force acts linearly along the length of the dam and at the reservoir level.

Question 1 (B)

1- Liquification of Soil:

Ground failure or loss of strength that causes other wise solid soil to behave temporarily as a viscous liquid. The phenomena occurs in water saturated unconsolidation soil affected by seismic swaves which cause ground vibrations during earth quake. Although earth quake shock is the best known cause of liquefaction.

2- Butress Dam:

It is a type of dam that consist of water retaining sloping membrane, that is supplied by a series of buttresses at right angle to the axis of the dam.

Buttresses dam uses buttresses to transfer the force of the water to the foundation.

3. Infinite slopes

An infinite slope is simply a vertical line when you plot it on a line graph, An infinite slope is any line which runs parallel to y- axis. we can also describe this as any line that does not move along the x- axis but stays fixed at one constant x- axis co-ordinate making the change along the x- axis 0.

4 Pier foundation:

A pier foundation is a collection of large diameter cylindrical column to support the super structure and transfer large super imposed load to the form streets below. It stood feet above the ground.

5 Dynamic Load:

It is a type of load that vary in thier magnitude, direction, or position with time. These are the time dependent Loads, The type of dynamic loading in soil or the foundation of a structure depends on the nature of the source producing it.

Question No 2 (A)

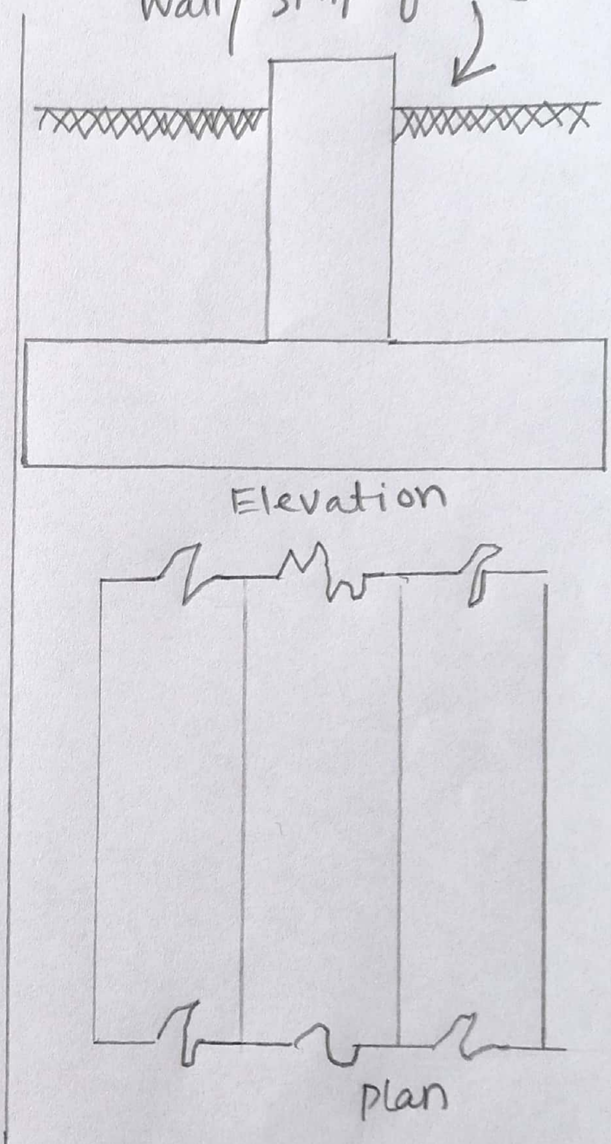
Shallow foundation

* According to Targzaghi: The foundation in which depth of the foundation is less or equal to width of the foundation is called shallow foundation.

* According to skempton: The foundation in which Df/b ratio is less than as equal to 2.5 than the foundation is called shallow foundation.

Types of Shallow foundation:

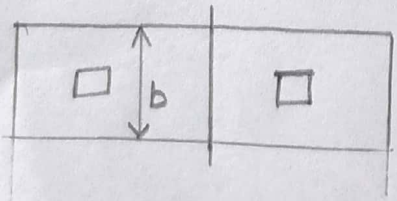
1: Wall/strip footing: The footing which run across the length of the wall and transfer the load of the wall to the soil safety. It called wall or strip footing.



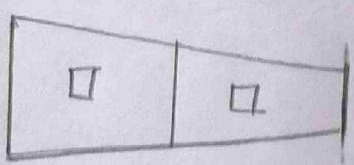
2 Combined footing :-

The footing which is constructed for two or more column and transfer the load of the two as more colum to the soil safety then it is called combined footing.

if the load column is uniform then the combined footing will be rectangular in shape. if the load of the column is not uniform the shape of the ~~column~~ combined footing will be trapezoidal



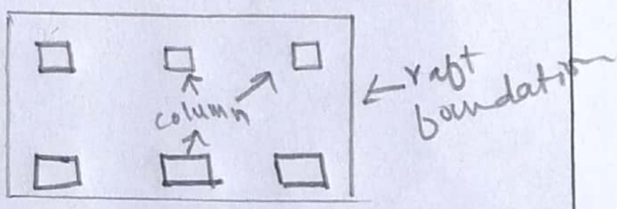
→ rectangular combined footing



→ Trapezoidal combined footing.

3 **Raft footing :**

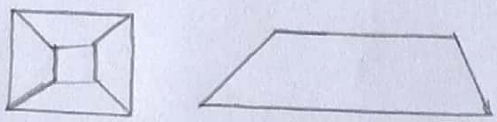
The footing which covers the whole area of the structure is called raft footing. This type of footing is proposed in area which have soil weak in bearing capacity.



Top view

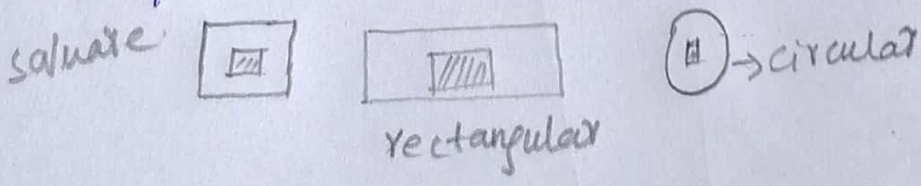
4 **Slopped footing**

The footing which ~~tappe~~ have slope in all direction as in all sides is called as slapped footing

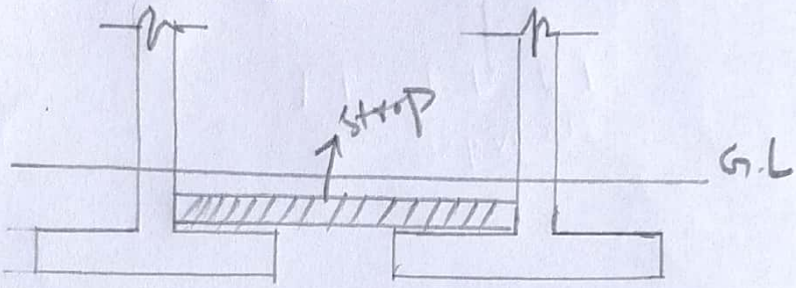


5- **Isolated footing:**

Footing which is constructed for a single column is transmit, its load to the soil safely it may be circular, square, rectangular. in shape.



6) 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.



Question NO 2(B)

Why ground techniques are important.

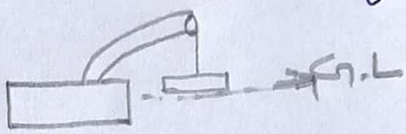
Ans: The soil in which volometric changes take place due to shrinkage and swelling such soil needs ground improvement techniques.

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

⇒ Methods of ground improvement techniques.

1) Dynamic compaction: The method is used to increase the bearing capacity of soil.

This also increases the consolidation rate. This method also increase the density of soil. In this method actually densification of soil take place.

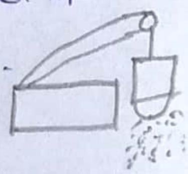


2) Dry Mixing of soil:

Dry soil mixing is ground improvement technique by which the characteristic of weak soil are improved by using day cementitias binder

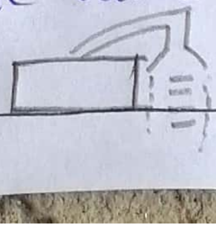
3) vibro concrete column:

vibro concrete column is a ground improvement technique which transfer the load from weak strata to hold strata by using strength concrete.



4) Rapid impact compaction:

Impact energy is applied to surface of ground as a result of which densification of soil take place up to a depth of 15 feet. This impact energy is actually applied through hydraulic ramp. The hydraulic ramp weight value from 4-8 tons.



5- **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 weak soil by using cementinious binder slurry.

Question No 3

Given data =

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

$\phi = 16^\circ$

$G = 2.72$

$e = 0.50$

Required:

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

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

Solution.

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

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

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

so

$$Fc = 1.18$$

when there is seepage of water

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

Now

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

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

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

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

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

$$= 21.04 - 9.8$$

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

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

$$\boxed{Fc = 0.816}$$

Question No 4 (a)

Given data:

height = $h = 10m$

$C = 18.8\ KN/m^2$

$\gamma = 17KN/m^2$

$\theta = 20^\circ$

$Fos = 1.5$

$F\phi = 1.0$

Required: Inclination = i = ?
angle for the embankment.

As we know that

By the help of taylor stability member formula

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

$$= \frac{18.8}{1.5 \times 17 \times 10} = 0.073$$

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

Now using taylor chart for the values.

$\phi = 20^\circ$

$SN = 0.073$

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

Question 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/m³
- unit weight of concrete = 1450 kg/m³
- Unit weight of silt = 1330 kg/m³
- Angle of friction for silt = $\theta_s = 35^\circ$
- Free board = 3.5m
- Silt deposite height = 2.5m

Required:- silt pressure = ?

As we know that

$$P_s = \frac{\gamma_s \times H_1^2}{2} \times \frac{1-\sin\theta}{1-\sin\theta}$$

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

$$\boxed{P_s = 1126.31 \text{ kg/m}}$$