7786
Sec A

Q1) **Forces Acting on Dam:-**

A) forces acting on a dam are as follow

Water Pressure
Weight of the dam
Ice Pressure
Wave Pressure
Earth quack Pressure
Wind Pressure
Silt and Uplift pressure:-

Uplift Pressure:-

It is almost impossible to make a dam imper-vious structure.
Many minute cracks and pass are lift in the dam and foundation body. The water in these crack exert upward pressure on dam.

Water Pressure:-

Water pressure is the most major external forces acting on a dam. The honzental water pressure exerted by the weight of water stored on the upstream side of dam.

Earthquake forces:-

The disturbance in dam is highly dangerous because they store huge volume of water
Dams builts in the area known to be

ID 7786
Sec A

semically active must be designed to withstand additional forces that are arises in a future shock.

Wave Pressure:-

The upper Portion of dam are subject to the impact of waves. Wave pressure against massive dams of appreciate height is usually of little consequence ~~convienence~~

5) Define the following terms:-

Liquification of soil:-

A phenomenon where by a saturated or partially saturated soil substantially loses strength and stifness in response to an applied stress ~~force~~ usually earthquake shaking, causing it to behave like a liquid is called soil liquification.

liquification is a process that leads to a soil suddenly losing strength, most commonly as a result of groundshaking during a large earthquake

Butress Dam:-

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

ID 7786
Sec A

Infinite Slope:-

Slope which have great extent with uniform soil condition at any given depth below the surface and the soil stratum is not necessary.

Pier foundation:-

A pier foundation consist of a cylindrical column of large diameter to support and tranfer large super-imposed loads to the firms strata below though pile foundation tranfer the load through bearing. pier foundation transfer the load only through bearing.

Dynamic load:-

Dynamic load is any load that moves changing magnitude or direction overtime. load in a static system are constant and unchanging shock load. impact load and vibrating load can all the considered dynamic in nature but are not the same.

ID 7986
Sec A

Q2(a)

SHALLOW FOUNDATION:-

The foundation in which depth of the foundation is less or equall to width of the foundation is called shallow foundation.

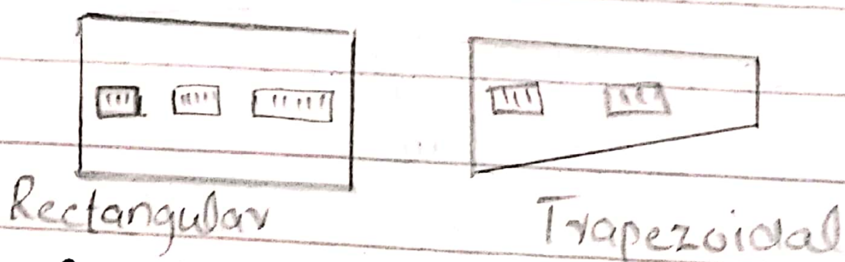
TYPES of Shallow foundation:-

Wall\Strip footing:-

The footing which runs across the length of the wall and transfer load of the wall, to the soil safety. It is called wall footing.

Combined footing:-

The footing which is constructed for two or more column and transfer the load of two or more column to the ground safety then it's called combined footing. If the load of column is uniform then it's rectangular in shape. If the load of column is not uniform then it is trapezoidal.



Raft footing:-

The footing which cover where area of the structure is called raft footing. This types of footing is proposed in area which have

ID 7786
Sec A

soil weak in bearing capacity. It is also provided when load of structure is heavy.

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.

Slopped footing:-
The footing which have slope in all direction as in all side is called slopped footing.

b) Importance of Ground Improvement Techniques:-

1) Prevent excessive settlements of the surface of reclemation area when structure like buildings roads and other foundations are loaded on it.
2) Improve shear strength of the fill and sub soil to ensure sufficient bearing capacity of the foundations and sufficient stability of slopes.
3) Increase the density of the fill mass and subsoil to prevent liquification.

ID 7786
Sec A

b) Improve soil permeability in order to increase drainage capacity.

Methods:-

Removal & Replacement of soil:-

This method is performed on loose soil. In this method unstable soil is replaced with compacted fill. This method is applicable above ground water table.

Dynamic Compaction

This method is used to increase bearing capacity of soil and also consolidation rate and density of soil. In this method densification of soil take place.

VIBRO COMPACTION:-

It is also called vibro classification. The compaction take place at certain depth in granular soil through vibratory probe. The probe is run by electric motor.

Rapid Impact Compaction:-

Impact energy is applied to surface of ground as a result of which densification of soil take place upto depth of 15 feet. This impact energy is actually applied through hydraulic ramp

ID 778C
Sec A

Wet Soil Mixing :-

In this method paste of cement is prepared and inserted in soil. This method is used to improve the dalasteristic of weak soil by using cementitious binder slurry.

Dry Mixing of Soil:-

In this method cholacteristic of weak soil are improved by ~~weak~~ using dry cemetitious binder.

ID 7786

Q No 3:- Sec A

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 (FOS) when there is seepage in soil.

Solution:-

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

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

$\gamma_d = 17.8 \ kN/m^3$

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

$F_c = 1.18$. **(when soil is dry)**

B) When there is seepage of water:-

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

$\gamma' = \gamma - \gamma_w$

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

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

ID 7786

Sec A

$\gamma = 21.04$ kN/m³

$\gamma' = \gamma - \gamma_w$

$= 21.04 - 9.8$

$\gamma' = 11.24$ kN/m³

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

$F_c = 0.816$

Q4)a) Given Data:-

Height = H , 10m

c = 18.8 kN/m²

γ = 17 kN/m²

ϕ = 20°

Fos = 1.5

F_ϕ = 1.0

Inclination = ?

Formula + Solution:-

from formula of inclination

$$S_N = \frac{c}{Fos \times \gamma \times H}$$

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

ID 7786

Sec A

$S_N = 0.073$

$\phi = 20^\circ$

$S_N = 0.073$

from taylor chart :-

if $\phi = 20^\circ$ and $S_N = 0.073$ then

$i = 44$.

Q4 (b) Given data:-

Unit weight of silt = 1330 kg/m³

Angle of Action for Silt = $\phi_s = 35^\circ$

Silt deposit hight = 2.5 m.

Top width = 6m

Bottom width of dam 12m

Solution:- from Silt pressure formula

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

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

$$P_s = 4156.25 \times 0.27098$$

$P_s = 1126.29$ ~~kg/m²~~ N/m² or kg/m