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Semester :

'6th'

Section :

'A'

Subject :

Geotechnical

Final Term

Question : 1.

Q1 (a)

Forces Acting On Dam:

1: Water pressure.
2: Uplift pressure.
3: Wave pressure.
4: Silt pressure.
5: Ice pressure.
6: Self weight of the dam.
7: Seismic forces

1: Water Pressure:

Water pressure is one of the mass major face acting on dam. The horizontial water pressure exerted by water stored on upstream side of dam can be collected from hydeostatic pressure distribution.

2: Ice Pressure

The ice which may be formed on water surface of reservior in cold countries may sometimes melt and expand. The dam face has to resist force exerted by expanding ice. This force act linearly along lenght of dam and at reservior level. The magnitude of this force varies from 250 – 1560 kn/l/m².

3: Wave Pressure:

Wave are generated on surface of reservior by blowing wind. which can cause a pressure towards downstream side wave pressure and it depend upon wave height.

4: Uplift Pressure:

Water seeping through the pores and fissures of the foundation material and water seeping through the dam of the body and there to the bottom through the joints b/w the body of the dam and its foundation at the base, exerts an uplift pressure on the base of dam.

5: Silt Pressure:

It is the pressure that is caused by the deposition of the silt in the bed of the dam causing at h/3 from the base and can be computed using eqn:

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

Q1. (b)

1: Liquification of Soil:

A Phenomena when by a saturated or partically saturated soil sub stantially loses strength and stiffness in response to an applied stress, usually earthquake shaking or other sudden change in stress condition causing it to behave like liquid.

2: Buttress D.M:

A buttress dam or hollow dam is basically a derivation of a gravity dam with the introduction of intermediate space.

With a buttress dam the face of the dam is held by a series of supports or butresses that are phaced at interval on the down stream side.

The butresses work to combat the face of reservoir water from trying to push the down water.

Infinite Slop:

An Infinite Slop is simple a vertical Line. Whene you phot it on a line graph an infini slop is any line which runs parallel to y-axis you can also

describle. This as any line that does not move along the x-axis but stays fixed at one constant x-axis cordinate making the change along the x-axis 0.

Pier Foundation:

A pier foundation is collection of large diameter cylinderial columns to support the super structure and transfer large supers exposed load to. from streta below:
It stood several feet above the ground.

Dynamic Load:

Dynamic load is very their magnitude, direction or

a position with line.

The type of dynamic load is soil the foundation of structure. depend upon on the nature of the sourse producing it.

Question : 2

Q2 (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.

Types Of Shallow Foundation:

Wall Footing
Combined Footing
Raft / Mat Footing
Strapped Footing
Column / Isolated Footing
Stepped Footing

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 footing.

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 combined footing.

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

If the load of column is not uniform then shape of combined footing will be trapezoidal.

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 bealing capacity This is also provided when the load of sopes structure is heavy.

Strapped Footing:

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

Column 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.

Slopped Footing:

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

Q.2 (b)

Ground Improvement Techniques:

Ground improvement techniques are the techniques which are used to enhance the engineering property of soil in orders to bear heavy structural Load.

Need Of Ground Improvement Techniques:

The soil in which volumetric 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.

Methods Of Ground Improvement Technique

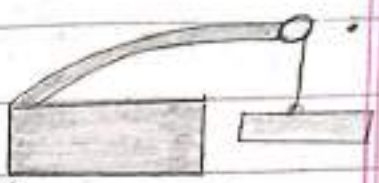
1 Remove and Replacement of Soil

This is an oldest and simple method. This method is performed on the 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 better engineering properties.

2: Dynamic Compaction

Fig: 1

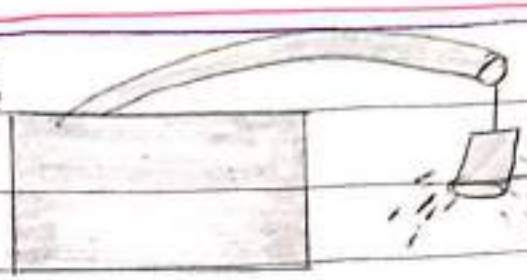


This method is is used to increase the bealing capacity of soil. This method also increase the constribution rate. This method also increase the density of soil.

3: Vibro Compaction:

It is also called vibro desertification. In This method the compaction takes place at a certain depth in granular soil through vibratory prode. This vibratary prde is run by an electric motor.

Fig:

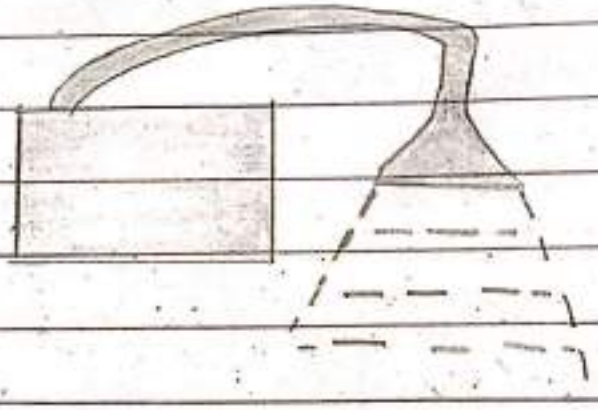


4: Rapid Impact Compaction:

Impact energy is applied to surface of ground as a result of which desertification of soil take phase upto a depth of 15 feet.

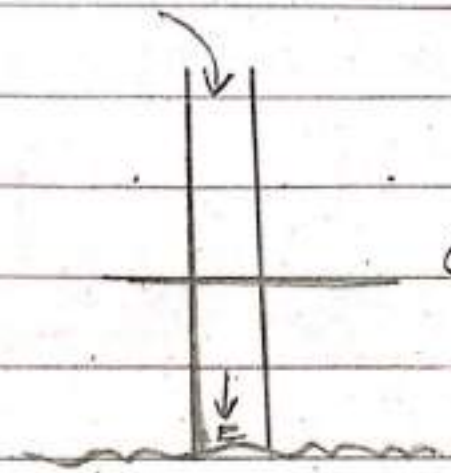
The hydrolic ramp weight valles from 4-8 tons.

Fig:



5 Vibro Concrete Column:

Vibro concrete columns is a ground improvement technique which transfer the bad from weak strength to hard strata by using strength concrete.



Q3:

Given Data:

$C = 25\ KN/m^2$

$\varphi = 16$

$G_s = 2.72$

$e = 0.5°$

⇒ Required:

Fc (F.O.S) when soil is dry?

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

⇒ Solution:

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

$$\Rightarrow \gamma d = \frac{G_s + \gamma w}{1 + e}$$

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

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

P.T.O

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

$$Fc = 1.18$$

⇒ When there is seepage of water:

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

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

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

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

$$\gamma = 21.04 \text{ KN/m}^3$$

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

$$\gamma' = 21.04 - 9.8$$

$$\gamma' = 11.24 \text{ KN/m}^3$$

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

$$\times \tan(26^\circ)$$

$$\boxed{Fc = 0.816}$$

Q4 (a)

Given Data:

Height = 10m

C = 18.8 K/m²

Θ = 20°

F.O.S = 1.5

Fϕ = 1.0

⇒ Required:

Inclination, i = ?

= Solution:

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

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

$$\boxed{SN = 0.073}$$

P.T.O

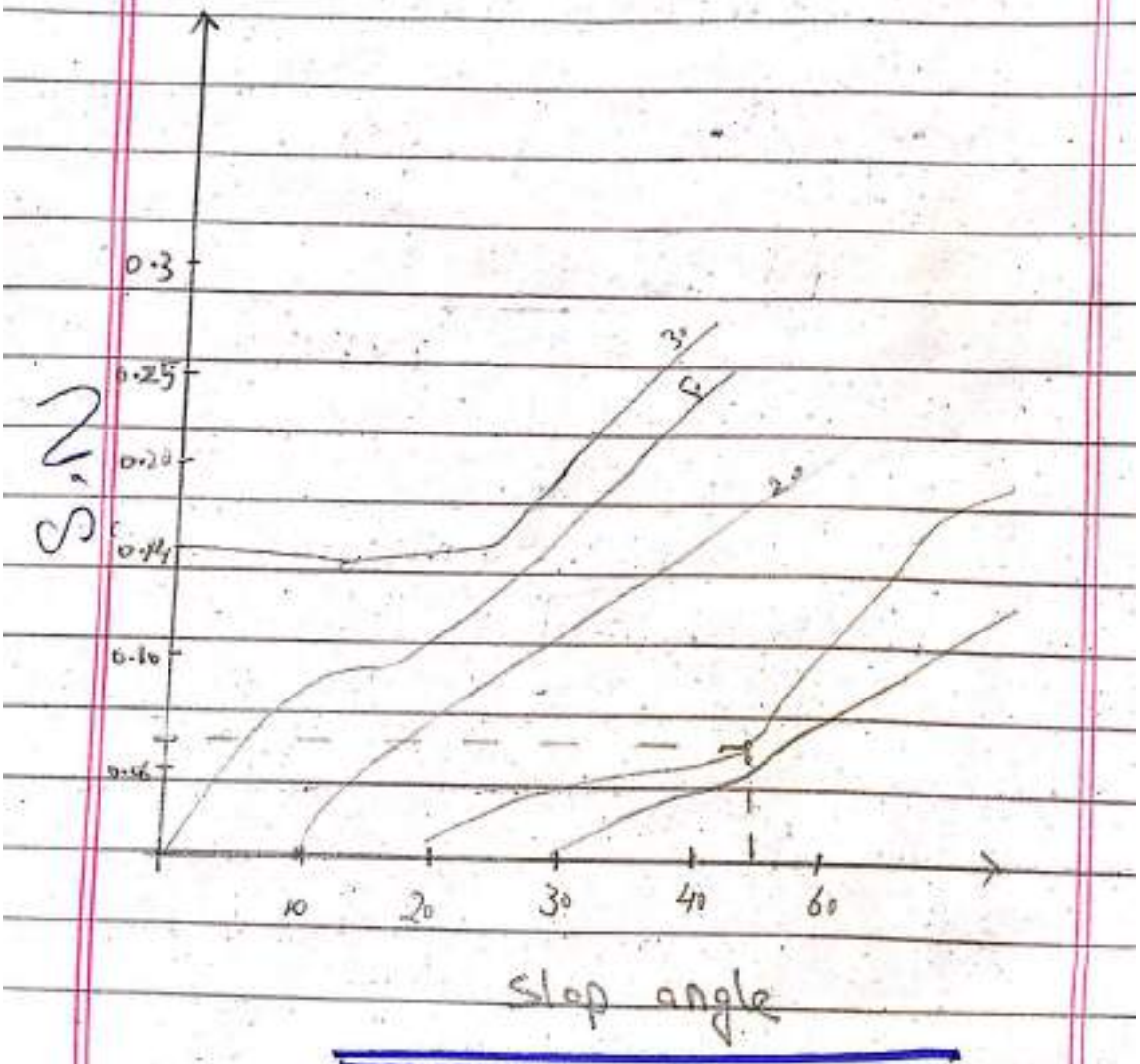
Using Taylor Chart for

$\theta = 20°$

$SN = 0.93$

$SN = 0.073$

$\boxed{i = 44°}$



Q4 (b)

Given Data

~~Height of water on upstream side = 15m~~

B

Weight of water on upstream side = 15m

Bottom width = 12 m
Top width = 6 m
Unit weight of water = 1000 kg/m²
Unit weight of concrete = 1450 kg/m²
Unit weight of silt = 1330 kg/m²
Angle of friction = θ_s = 35°
Free Board = 3.5
Silt Deposite height = 2.5

Required:

Silt pressure = ?

P.T.O

Solution:

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

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

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