IQRA NATIONAL UNIVERSITY

Geotechnical foundation and engineering

Final Term Assignment

Name = Mansur ul haq

I.D = 7736

Section = (B)

Teacher = Engr.liaqat bacha

Semester = 8th

Dated = 27th June 2020

Q#01

part (A)

Force Acting ON Dam:-

1. water pressure
2. uplift pressure
3. wave pressure
4. silt pressure
5. Ice pressure
6. S.wt weight of the dam.
7. Seismic forces.

①:- water pressure:- This is the major external force acting on dam.

* Pressure components on both upstream and downstream are:-
  - i- vertical component.
  - ii- Horizontal component.

Unit weight of water, $\gamma_w = 1000\ kg/m^3$

②:- weight of Dam:- This is the major resisting force.

* Generally unit length of dam is considered.
* The cross Section of dam may be divided into several triangles and rectangles and weights w_1, w_2, w_3 etc.- may be computed.
* The total weight w of the dam acts at the C.G of its Section.

③ Ice pressure:-

i- The ice formed on water surface of the reservoir is subjected to expansion and contraction due to temperature variations.

ii- Coefficient of thermal expansion of ice is 5 times more than concrete.

iii- The dam face has to resist the force due to expansion of ice.

④ Self-weight of Dam:-

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

$$W = \gamma_m \text{ Volume}$$ Eavuation 11

where:

γ_m : unit of dam material.

⑤. Silt pressure:-

The weight of dam and its foundation is a major resisting force. it act at h/3 from the base and can be computed using eavuation 12:

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

where:

K_a : Coefficient of active earth pressure of Silt which eavual to

$$\frac{1-\sin\phi}{1+\sin\phi}$$

ϕ : Angle of internal friction of Soil, Cohesion neglected.

Q No#1 Part(B)

Define the following terms.

① **Liquification of Soil:-** Effective Stresses are the Stresses which keep the Soil Particles in contact with each occer if the effective Stresses decrease the Soil loose its Strength. when the effective Stresses became zero than Soil will change to liquidfield state.

② **Buttress Dam:-** uses buttresses to transfer the force of the water to the foundation.

③ **Infinity Slope:-** The Slope which have infinity area and finite depth such a Slope is called as infinite Slope.

Example:-

Natural Slope i.e Hills, Maintains, desert etc Causes of failure.

④ **Pier foundation:-**

The vertical member which have larger die as compaled to pile and transmit the load of structure to the underground Soil. They are constructed by cast in-Situ process.

⑤ **Dynamic load:-**

A live load as a motor vehicle in motion on a structure as a bridge.

END PART

Q No ② Part ①

- Shallow foundation:-

* According to Terzaghi:- The foundation in which depth of the foundation is less as eaual to width of the foundation is called shallow foundation.

$$Df \leq B$$

* According to Skemption:- The foundation in which Df/B ratio is less than as eaual to 2.5 than the foundation is called Shallow foundation.

Types of Shallow foundation:-

i- wall footing.
ii- Combined footing.
iii- Raft / Mat footing.
iv- Strapped footing.
v- Coloum / Isolated footing.
vi- Slapped footing.

① wall / strip footing:-

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

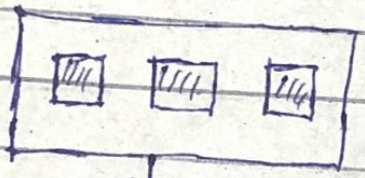
soil safely.

(2) - Combined footing :-

The footing which is constracted for two or more coloum and transfer the load of the two or more coloum to the soil safely then it is called combined footing.

If the load of coloum is uniform then the combined footing will be rectangle in shape.

If the load of the coloum is not uniform then shape of combined footing will be traperiodal.



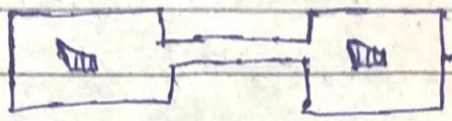
Rectangular

Trapezaidal

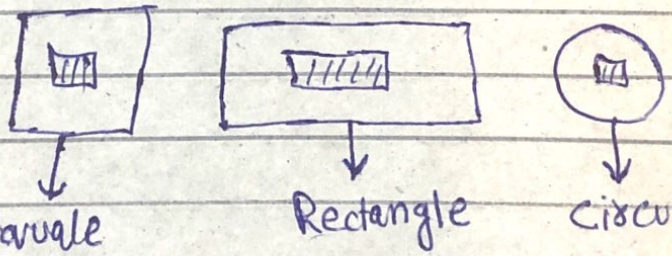
(3) Rafi / Mat Footing :-

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 soper structure is heavy.

(4) Strapped footing:- The footing in which the outer Coloum is connected with the inner Coloum by means of the beam or Strap is called strapped footing.



(5) Column / Isolated footing:- The footing which is constructed for a single coloumn and transmit its bad to the soil safely. It may be circular, Squale, rectangular in shape.



#01

Q#02:- PART #B

IMPROVEMENT TECHNIQUES:-

G.Improvement techniques are the mechanisms which are used to enhance the property of soil in order to engineering for heavy structural load. The main properties are shear strength, permeability bearing capacity, stiffness etc.

METHODS OF G.I.T:-

(01) Removal & Replacement of Soil:-

This is the oldest & simple method. This method is performed on loose soil. The above table. Method is applicable the ground water

② Dynamic Compaction :- This Method K used to Increase the bearing Capacity of soil this also Increase the Consolidation rate. This Method also Increase the density of soil. In the method actually densification of soil take place.

③ Vibro Compaction :- It is also called Vibro In the method the Compaction zones place at a certain Depth. The penetration of pipe is entrance by ejecting water at the tip of probe.

④ Rapid Impact Compaction :-
Impact Energy it is the applied at surface of ground as a result of which densification Depth is feet. The hydraulic ramp weight varies from 4-8 tons.

⑤ Vibro Concrete Columns :-
Vibro Concrete Columns It is a ground Improvement technique which transfer the load from weak

Strata is hard Strata by using Strength Concrete.

Q #No #03 → PART #(A)

* GIVEN DATA :- $C = 25\ KN/m^2$
$\phi = 16°$
$G = 2.72$
$e = 0.50$

* REQUIRED :- f_c (F.O.S) when Soil is Dry
f_c (F.O.S) when There is Seepage in Soil

* SOLUTION :-

$$f_c = \frac{C}{\gamma_d \times 1 + x \sin i \cos i} + \frac{\tan\phi}{\tan i}$$

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

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

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

$$F_c = 1.18$$

→ When there is seepage of water.

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

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

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

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

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

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

$$\gamma' = 21.04 - 9.8$$

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

$$F_c = \frac{25}{21.04 \times 6 \times \sin(60^\circ) \times \cos(26^\circ)} + \frac{11.24}{21.04} \times \frac{\tan(16^\circ)}{\tan(60^\circ)}$$

$$F_c = 0.816$$ Answer.

Q No (4) Part (A)

Given Data:-

* Height = H = 10m
* C = 18.2 kn/m²
* γ = 17 kN/m³
* φ = 20°
* Fos = 1.5
* Fφ = 1.0

Required:-

Inclimation i = ?

Solution:-

As we know that

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

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

$$S_N = 0.073$$

Usery Taylor chart for φ = 20°

$S_N = 0.073$

then

i = 44 (from layter chert).

Q No (4) Part (B):-

Given Data:-

- Height of water an upstream Side = 15m
- Bottem width of the dam = 12m
- Top width = 6m
- unit ~~weigth~~ weigth of Concrete = 1450 kg/m²
- unit weigth of water = 1000 kg/m²
- unit weigth of Salt = 1330 kg/m²
- Angle of friction for Silt = $\phi_s = 35°$
- free Bond = 3.5m
- Silt Deprite height = 2.5m

Required :- Silt pressure = ?

Solution :- As we know that

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

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

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

End