

Question # 2(A) Soil Nailing :-

Soil nailing is a construction remedial measure to treat unstable natural soil slopes or as a construction technique that allows the safe over-sloping of new or existing soil slopes. Kinetic methods of firing relatively short bars into soil slopes have also been developed.

Favorable Condition :

Based upon these favorable conditions for soil nailing stiff to hard fine-grained soils which include stiff to hard clays, clayey silts, silty clays, sandy clays, and sandy soils are preferred soils.

Sand and gravel which are dense to very dense soils with some apparent cohesion also work well for soil nailing.

(P.T.O)

To overcome those problem, researchers concerned on soil, improvement techniques by adding fibers. The main objective of our project is to investigate the use of pill and lime in geotechnical application and to evaluate the effects of pill and lime with black cotton.

→ Standard proctor compaction  
Unconfined Compressive strength by  
curing of normal black cotton soil  
with stabilized black cotton soil  
and determining optimum dosage of  
lime and pill to be added to  
soil

End

Eductor Wells Method of Dewatering Excavations

This method is very similar to the wellpoint method of dewatering. The only difference lies in the usage of high pressure, water in the riser units instead of vacuum to draw out water from the well points. The method uses the Venturi principle which is the reduction in fluid pressure that results when a high-pressure fluid flows through a constricted section of a pipe.

Open Sump Pumping Method of Dewatering Excavations

This is the most common and economical method of dewatering as gravity is the main driving force. Sump is created in the excavated area into which the surrounding water seeps and accumulates facilitating easy discharge of water through robust solid handling pumps.

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Q3 (A) Causes for which ground improvement techniques are under taken

→ Ground improvement is carried out to prevent excessive settlements of the surface of the reclamation area, when structures like buildings, roads and other foundations are loaded on it, improve shear strength of the fill and subsoil to ensure sufficient bearing capacity of the foundation and or sufficient stability of the slopes, increase the density of the fill mass and or subsoil to prevent liquefaction and improve soil permeability in order to increase drainage capacity.

These are the certain causes for which ground improvement techniques are under taken

(P.T.O)



modulus ratio is small and can be ignored, especially when  $E_c/E_s$  is large than 20

## (b) Types of Ground Improvement Used in Black Cotton Soil :-

Black cotton soil is a highly clayey soil. They are found in many parts of the world, such kind of soil generally consist of active clay minerals, geotechnical engineers face various problems while designing foundation, because the black cotton soil possess poor bearing capacity and excessive settlement

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- Any satisfied clients throughout the regions have been pleased with the success of this method, when installed by engineers solution.
- The one main disadvantage of this technique is that, it is a bit messy and may require cleanup

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Question # 3

(A)

(P.T.O)



Q2 (b)Characteristics for A Grout Mixture

↪ There are four main characteristics for a grout mixture

1 → Including bleeding

2 → Setting time

3 → Strength

4 → Viscosity

↪ We want to build some efficient grouting mixtures with different water to cement ratios considering these characteristics.

Common uses for grout in the household include filling in tiles of shower floors and kitchens. It is often color tinted when it has to be kept visible and sometimes include fine gravel when being used.

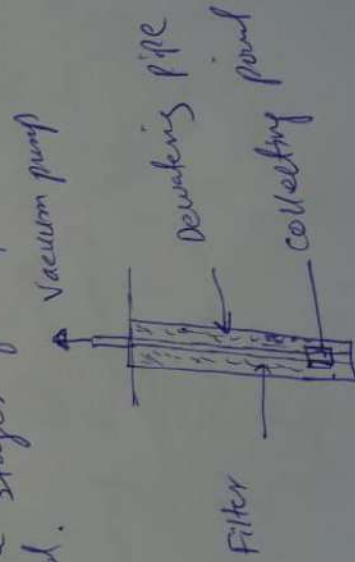
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Closely spaced wells which on the surface are connected to a flexible piping pipe, which is ultimately appended to a common header pipe that is responsible for discharging the water away from the site.

→ One end of the header pipe is connected to a vacuum pump which draws water through notches in the well points. The water then travels from the wellpoints through the flexible piping pipe into the header pipe to the pump.

→ The drawdowns using this method is restricted to around five to six meters below the wellpoint pump level. If a deeper drawdown is required multiple stages of wellpoint must be used.



### Advantages :

- Compacting granular causes minimal disruption to the landscape, surrounding soils, and nearby structures.
- This technique can be utilized for projects that have limited access and require more delicate installation and require more delicate installation.
- It is cost effective and easy to install compare to some other soil stabilization and ground-strengthening methods.
- Engineered Solutions has used this versatile technique on a variety of projects, and it has successfully strengthened ground soils in each instance.

### Disadvantages :

- It is a very effective, affordable and practical soil stabilization technique.

## Deep well Method of Dewatering Excavations

- Just like the wellpoint method, wells are drilled around the excavated area, but the diameter of wells, varies between 150 - 200 mm. By creating deep wells around the vicinity, the groundwater is made to fall into them under the influence of gravity.
- As a result, the groundwater level in the surroundings would decline according to the type and arrangement of pumps, the depths of the wells could reach up to 30m. This method is generally adopted when a heavy amount of water from the ground has to be drawn out.

Q1 Ends

Q#3 (b)Various Geotechnical Problem  
of Expansive Soil

→ it is important to identify expansive soils using indirect features before analysing samples in laboratory.

→ One kind of expansive soil is vertisol, which has characteristic

feature land forms in aerial photograph whereas in the field work it is common to observe surface cracks.

→ Soils are composed of a variety of minerals, most of which do not expand in the presence of moisture, however, a number of clay minerals are expansive. These include, smectite, bentonite, montmorillonite etc

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Q#1 (b)

Dewatering Techniques

There are four important dewatering methods, which are

- Wellpoint method of dewatering
- Eductor wells
- Open sump pumping and
- Deep well point method

Wellpoint Method of Dewatering

→ A series of wells of required depth are created in the vicinity of the excavated area from where the water has to be pumped out. The wells are arranged either in a line or a rectangular form where the well point are created at a distance of at least 2m from each other.

→ Riser pipes or de-watering pipes are then installed into those

(P.T.O)

## Soil Additives and Their Functions :-

→ Traditional additives include crop residues, livestock manure and sewage sludge, Non traditional soil conditioners include both organic and inorganic products such as composed organic materials which also may be supplemented with inorganic materials such as unprocessed rock phosphate or ground limestone.

→ Other additives include lime and asphalt

→ Most common additive is portland cement.

Question # 1(A) Improve Soil through  
Excavation and Replacement :-

↔ Soil properties can be improved to better condition through excavation and replacement.

↔ One of oldest and simplest methods is simply to remove and replace the soil.

↔ Soils that will have to be replaced include contaminated soils or organic soils.

↔ Method is usually practical only above the groundwater table..

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