Qno (01) A

Answer :

Soil improvement techniques .

- Surface compaction .
- Drainage method
- Vibration method
- Pre - Compression & Consolidation
- Grouting & Injection
- Soil Reinforcement
- Geotextile & Geomembranes.

Additive names which are used for soil modification ?-

- Plastic additives
- Fly Ash
- Industerial waste
- Auxilliary Additives
- Chemical Admixtures.
- Polymer soil stabiligation
- soil conditioner.

Qno (1) - B

Dewatering Techniques :

Following are the dewatering Techniques which are widely used for ground Improvements .

(1) Sump Pumping .
(2) Well Points .
(3) Deep Wells .
(4) Eductor wells .

(1) Sump Pumping :

- Water is collected in deeper parts of the excavation and pump away.
- Simple and cheap method of dewatering in favourable ground condition.
- The sump takes up space with an excavation.
- Can lead to water pollution, due to silt-laden water .

(2) Well Points :

- A line or ring of small diameter shallow wells installed at close spacing around the excavation .

- Commonly used for dewatering of pipeline trenches.
- Can be a very flexible & effective method of dewatering in sands or sands & gravels.
- Drawdown limited to 5 or 6m below level of Pump due to suction lift limits.
- Individual well points may need to be Carefully adjusted.

(3) Deep Wells :

- Wells are drilled at wide spacing to form a ring around the outside of the excavation.
- An electric submersible pump is installed in each well. drawdown limited only by well depth and soil stratification
- Effective in a wide range of ground Condition, Sand, gravel, fissured rocks.

(4) Eductor Wells :

- Effective in stabilizing fine soil by reducing pore water pressure.
- Wells are drilled around or alongside the excavation.

- Suitable when well yields are low.

Flow capacity 30 to 50 liters/min per well.

- Drawdown generally limited to 25 to 30 m below pump level.
- Vaccum of 0.95 m Bar can be generated in the well, making this very effective in low permeability soils.

Qno (02) - A

What do you understand about soil nailing? Under what condition the soil nailing is Prefferable ?

Soil Nailing is a technique to Reinforce & strengthen ground adjacent to an excavation by installing closely spaced steel bars called "nails" as construction proceeds from top down.
it is an effective and economical method of constructing retaining walls for excavation supports, supports of hill cut, bridge abutments and highways.
The nails are subjected to tension compression, shear and bending moments.

Conditions :

The main consideration for deciding whether soil nailing will be appropriate include, The ground condition, The suitability of the other systems, such as ground anchor, geosynthetic material and so on and cost.
Although Soil nails are versatile and can be used for a variety of a soil types and condition. it is preferable that the soil should be capable of standing - without Support

to a height of 1-2 m for no less than 2 days when cut vertical or near vertical.

Soil which are particularly suited to soil nailing include clays, clayey silts, clays, silty clays, sandy clays, glacial soil, sandy soil and sand gravel.

Soil nailing can be used on (soil nailing) Weather Rocks as long as the weathering is even Throughout the Rock.

Soil which are not well-suited to soil-nailing include Those with a high ground water Table, cohessionless soil, soft fined grained soils, highly corrosive soil, loess, loose grainular soils, and ground exposed to repeated freeze-Thaw skin, action.

Qno (2) - B

Characteristics of grouting, where and why grouting is required :

Grouting is a process whereby stabilizers, either in the form of suspension or solution are injected into subsurface soil or rock

Grout is a construction material material used to embed rebars in masonary walls, connect section of pre-cast concrete, fill voids and seal joints.

- Grouting is required to filled the unfilled area for sealing and strengthing the ground in order to prevent water enterance or any failure after excavation.

Compaction Grouting :

Compaction grouting involves The injection of a low slump, mortar grout to density loose, granular soils and stabilise subsurface voids & sinkholes.

Advantages and Disadvantages of Grouting

- Advantages :

1. This can be done on almost any ground condition.
2. It does not induce vibration and can be controlled to avoid structural damage.
3. Improvement in-ground structures can be measured.

4. Very Useful for limited space & low head-room applications.
5. Use for slab Jacking that lift or level the deformed foundation.
6. It can be installed adjacent to existing walls.

Disadvantages :

The one main dis-advantages of this techniques is that it is a bit messy and may require clean up.

Qnd(3) - A

What are the causes for which ground improvement techniques are under taken?

Ground improvement techniques are used when the behaviour of the fill mass and or the under lying soil does not meet required design criteria.

Causes or Reasons for ground improvement techniques :

Ground improvement techniques is carried out to

- prevent excessive settlement of the surface of the reclaimation area when structure like building, roads and other foundation are loaded on it.
- Improve shear strength of the fill & sub soil to ensure sufficient bearing capacity of the foundation and or sufficient stability of the slopes.
- Increas the stability / density of the fill mass and/or subsoil to prevent liquefaction
- Improve soil permeability in order to Increase drainage capacity.

Qno (03) - B

Identify Various geotechnical problems of expensive soil ?

Answer.

Expensive clays are soils that are very Special as regards the impact of external factors. from an engineering point of view, the occurance of substratum shrinkage phase after the swelling phase is the most dangerous of construction.

Geotechnical problems of expensive soil is considered to be one of the more problematic Soils and it causes damages to various civil engineering building / structures because of its swelling and shrinking potential when it comes to into contact with water. Expansive soil behave differently from other normal soil due to their tendency to swell and shrink

Main Geotechnical problems of expensive soil are some of the following:

- Structural Damage to light weight structure such as sidewalk & driveways.
- Lifting of building, damages to basement & building Settlement.

- Cracks in Walls & Ceiling.
- Damage to pipeline & other building/ Public utilities
- Loss of Residual Shear strength causing instability of slopes etc
- Lateral movement of foundation and Retaining Walls due to pressure exerted on vertical walls.

Therefore it is essential to check the presence of expensive soil and a suitable treatment method should be adopted before commencing any construction project.

Qno(04) - B

Which type of ground improvements would be used in black cotton soil and why?

Answer :

Black cotton soil is 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.

To overcome Those problems research concentrated on soil improvements techniques by adding lime. By adding lime to black cotton soil the pozzolonic reaction take place & stabilization occur. Theg hydrated lime react with a clay particle and permanently transform them into a strong cementatious matrix.