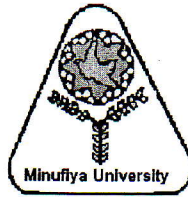


Menoufia University  
Faculty of Engineering  
Shebin El-Kom  
Dept. : Civil Engineering  
Semester : Second-Final Exam  
Academic Year: 2015-2106



Postgraduate: Diploma  
Subject: Improvement of Soil Properties  
Code No. : CVE 517  
Date: 06/06/2016  
Time Allowed: 3.00 hours  
Total Marks: 100

Answer the following questions and any missing data can be reasonably assumed

Question(1)

(20)

- 1-a) Explain in details the six primary functions of geosynthetics.
- 1-b) Describe the used methods for quality control of compaction in the field.
- 1-c) Calculate the time required for (U) of 90 % consolidation of a saturated silty soil using wick drains with a triangular spacing of (D); 2.1, 1.5, 0.6 m. The wick drain dimensions is  $100 \times 4$  mm and the soil has a coefficient of consolidation for horizontal flow ( $c_h$ ) of  $6.5 \times 10^{-6}$  m/min. You can use the following equation:  $T = [D^2 / (8 c_h)] \times \{ \text{Ln} (D/d) - 0.75 \} \times \text{Ln} (1 / (1-U))$ , where; d = circumference/ $\pi$ .

Question(2)

(23)

- 2-a) Discuss the required geosynthetic properties for reinforcement application.
- 2-b) During the construction of an embankment, the following data are recorded as follows:
  - 1- Soil from borrow pit has natural density =  $1.75 \text{ gm/cm}^3$ , water content = 10%.
  - 2- Soil after compaction has density =  $2.0 \text{ gm/cm}^3$ , water content = 15%.Estimate the quantity of soil to be excavated from the borrow pit and the amount of water to be added for every  $1000 \text{ cm}^3$  of compacted soil of the embankment.
- 2-c) Explain preloading method as one of soil improving methods.
- 2-d) Discuss in details the using of sand drains as one of soil improvement techniques.

Question(3)

(22)

- 3-a) Make a comparison between required geotechnical investigation for ground improvement project and a regular construction project.
- 3-b) Differentiate between mechanical stabilization and chemical stabilization.
- 3-c) Loose sand layer of 15 m thick located at project site in Alexandria city, a drooping of a heavy weight was used as one of soil improvement techniques. Design the system to achieve a depth of compaction using Leonard's formula ( $D = 0.5 (W \times h)^{1/2}$ ).
- 3-d) Show how slope stability can be improved.

Question(4) Comment on the following statements by True or False & explain as possible:

(15)

- 1- Lime and Portland cement are used to improve soil properties and reduce or eliminate erosion.
- 2- Gabions or cages made of fencing material used to enclose large rocks and make erosion resistance surfaces for soils.
- 3- The presence of organic material in the layer treated with lime can detrimentally affect the results of lime treatment.
- 4- Tieback wedge analysis method is considered the most common and most conservative method to analyze the internal stability of geotextile reinforced retaining walls.
- 5- H. Vidal developed modern reinforced soil technology in France.
- 6- Selection of appropriate filling materials is not an important aspect for the design of reinforced embankment.
- 7- For plastic fine-grained soils, Portland cement modification is used to increase plasticity.
- 8- There is a decrease in bearing value as strength increase and a decrease in workability after treatment with soil because of the base exchange and conglomeration of particles.
- 9- Natural fibers such as cotton, jute, bamboo could not be used as geotextiles and geogrids, especially for temporary applications.

- 10- Index properties give an actual design property as performance test for geosynthetics.
- 11- Retaining walls are required where a soil slope is uneconomical or not technically feasible.
- 12- Geogrids and geotextile reinforcement enables embankments to be constructed over very soft foundations.
- 13- Today, geosynthetic reinforcement must be considered as feasible treatment alternative for embankment on soft foundations.
- 14- Lateral spreading failure for reinforcement embankments can be prevented by the development of adequate shearing resistance between the base of the embankment and the reinforcement.
- 15- Most failure of precast segmental concrete block-faced wall systems are due to inadequate design and problems in construction.

**Question(5) Choose the correct answer for the following:**

(20)

- 1- In soft cohesive soil, the vibroflotation technique used with:
  - a- Gravel as backfill material.
  - b- Sand as backfill material.
  - c- Any type of cohesionless soil.
- 2- Depth of compaction for soil using dropping of a heavy weight can be reached up to:
  - a- 12 m.
  - b- 10 m.
  - c- 20 m.
  - d- 30 m.
- 3- Blasting has been used to densify loose granular soils with a maximum percentage of :
  - a- 15 %.
  - b- 10 %.
  - c- 25 %.
- 4- Preloading is a technique that can successfully use to densify:
  - a- Soft cohesive soils.
  - b- Cohesionless soils.
  - c- Cohesive and cohesionless soils.
- 5- Mix design for Portland cement modified soil can be followed by a series of:
  - a- Strength tests as CBR and triaxial tests.
  - b- Field application and gradation.
  - c- Mix and compaction.
  - d- Finer pulverization.
- 6- Sand drains have been used extremely in many parts of the world, as:
  - a- Stabilizing soil for port development works.
  - b- For foundations of structure in reclaimed areas.
  - c- For reclaimed areas on the seacoasts.
  - d- One of the above.
- 7- As stated by Bowles, 1996, stone columns are not applicable to:
  - a- Thick deposits of peat.
  - b- Highly organic silts.
  - c- Highly organic clays.
  - d- All of the above
- 8- Lime stabilization has been extensively used to:
  - a- Decrease swelling potential.
  - b- Decrease swelling pressure.
  - c- Decrease plasticity.
  - d- Any one of the above.
- 9- Lime has been used as a stabilizer for soils in
  - a- Base courses of pavement systems.
  - b- Under concrete foundation.
  - c- On embankment slopes.
  - d- Canal lining.
  - e- Any one of the above.
- 10- Bituminous materials improve:
  - a- Bearing capacity and soil strength of cohesive soils.