Menoufia University **Faculty of Engineering** **Shebin El-Kom** **Dept. : Civil Engineering** **Semester : First-Final Exam** **Academic Year: 2017-2108**		**Postgraduate: Diploma** **Subject: Improvement of Soil Properties** **Code No. : CVE 517** **Date: 08/01/2018** **Time Allowed: 3.00 hours** **Total Marks: 100**

Answer of the following questions and assume any missing data

Question(1) (25)

1-a) Explain the construction process for lime treatment as used one for soil improvement.

1-b) What are the solutions that can be used to overcome the unsuitability of construction site?

1-c) How do you select a proper geosynthetics to increase the strength of subgrades.

1-d) During performing of soil improvement program at construction site in 10th Ramadan city, a loose sand layer beginning from ground surface and extend up to 10 m down .A drooping of a heavy weight was used as one of one of ground improvement techniques. Design the system to achieve a depth of compaction using Leonard's formula ($D = 0.5\ (W \times h)^{1/2}$).

Question(2) (25)

2-a) Write a brief note on the different types of geosynthetics and their applications.

2-b) List the typical objectives of soil improvement.

2-c) Calculate the ultimate load for stone column used to improve the properties of soft clay. The diameter of stone column is 35 cm. The stabilized soil has the following data:Angle of internal friction is 28°, cohesion equals to 0.8 t/m^2. you can use the Bowels formula ($q_{ult} = K_p\ (4C + \sigma')$).

2-d) Define the following:

- Sheet erosion of an exposed clay.
- Wall facing systems.
- MARV.
- CEC.

Question(3) (25)

3-a) Discuss the differences between the internal and external stability of reinforced soil retaining walls.

3-b) Discuss the different failure modes of reinforcement placed in the soils.

3-c) List the types of moisture control method used for making the soil mass more stable.

3-d) For construction of an embankment in the road between Banaha City and Shobra , the following data are given as:

1- Soil from borrow pit has natural density = 1.8 t/m^3, water content = 12 %.
2- Soil after compaction has density = 2.0 t/m^3, water content = 14%.

Estimate the required quantity of soil to be excavated from the borrow pit and the amount of added water to each 1 m^3 of compacted soil of the embankment.

Question(4) <u>Choose the correct answer for the following</u>: (25)

1- Soil improvement can:
   a- Give a higher soil shear strength.
   b- Give a less compressible soil
   c- Produce a controlled permeability material.
   d- Any one of the above.
2- Clay particles obtain initial charges from:
   a- Broken bonds.
   b- Isomorphic substitutions.
   c- Inner clay structures imperfections.
   d- All or Any one of the above.
3- Compaction is:
   a- Artificial densification of soil mass for one or more reason.
   b- Change of soil composition.

c- Natural process for combining grains together.

4- Normally the used values for relative density in the field is:
   a- Between 75 and 85 %.
   b- Below 66 %.
   c- More than 100 %.

5- CEC values is higher for:
   a- Montmorillonite.
   b- Illite.
   c- Kaolinite.

6- Compaction as one of mechanical improvement methods:
   a- Is cheapest.
   b- Extensively used in highways and dams.
   c- Available and common method.
   d- Any one of the above.

7- When "poor" or inadequate soil and/or site conditions prevail, one must consider the available alternatives for the situation. These alternatives may include:
   a- Abandon the project.
   b- Excavate and replace the existing "poor" soil.
   c- Modify the soil to improve its properties.
   d- Any one of the above.

8- Methods of studied soil improvement in this course include:
   a- Mechanical & dynamic compaction.
   b- Vibrofloating and/ or preloading.
   c- Geosynthetics.
   d- Admixtures.
   e- All of the above.

9- Admixture soil improvement refers to any improvement application where:
   a- Some material is added.
   b- Mixed with existing soil.
   c- Placed soil to enhance the engineering properties.
   e- Any one of the above.

10- All geosynthetics specification should include:
   a- General requirements.
   b- Specific geosynthetic properties.
   c- Placement procedures & overlaps.
   d- Acceptance and rejection criteria.
   e- All of the above.

11- Sand drains have been used extremely in many parts of the world, as:
   a- Stabilizing soil for port development works.
   b- For reclaimed areas on the seacoasts.
   c- For foundations of structure in reclaimed areas.
   d- Any one of the above.

12- As reported by Bowles, stone columns are not applicable to:
   a- Highly organic silts.
   b- Thick deposits of peat.
   c- Highly organic clays.
   d- All of the above.

13- Seams for geosynthetics may be done by:
   a- Sewing.
   b- Mechanical fastener.
   c- Thermally or chemically bonded.
   d- Any one of the above.

14- The purpose of injecting a grout is:
   a- To decrease permeability.
   b- To increase shear strength.
   c- To decrease compressibility.
   d- One or all of the above.

15- A minimum overlap in geosynthetics applications should be:

a- 30 cm.
b- 15 cm.
c- Variable per each product.

16- Thermal treatment refers to the modification and/or stabilization of soils by application of:
a- Heat for improving properties of clayey soils.
b- Blending material.
c- Nuclear energy.
d- No one of the above.

17- Geosynthetics are:
a- Planar products.
b- Polymeric materials.
c- Used with geotechnical-related material.
d- All of the above.

18- In cement stabilization, cement requirements depends on:
a- Gradation of the soil.
b- Soil strength.
c- Mixing time.

19- Blasting technique is used to densify:
a- Loose granular soil.
b- C-ϕ soil.
c- Fine grained soil.
d- All of the above.

20- Bituminous soil stabilization cab be used for:
a- Cohesive soils.
b- Sandy soils.
c- Any one of the above.

21- The type of admixture material to be used will depend on a number of variables including:
a- Soil type to be treated.
b- Purpose of use.
c- Engineering properties desired.
d- Minimum specification of engineering properties.
e- Any one of the above.

22- Compaction techniques as:
a- Dynamic compaction.
b- Vibroflotation.
c- Blasting.
d- Any one of the above.

23- Grouting can be defined as:
a- The injection of flowable materials into the ground under pressure.
b- Alter the engineering characteristics of the ground.
c- Modification of the ground by filling voids and cracks.
d- Any one of the above.

24- Lime stabilization improves the strength of:
a- Fine grained soil.
b- Cohesionless soil.
c- Sand deposits.
d- No one of the above.

25- Field quality control of compaction can be achieved via:
a- Nuclear density test.
b- Smooth wheeled rollers.
c- Adding water to treated soil.

With our best wishes.

This exam measures the following ILOs																
Question Number	Q1-a	Q2-a	Q2-c,d	Q3-a	Q4		Q1-c, Q1-d	Q2-b	Q3-b	Q3-d	Q4		Q1-b	Q3-c	Q4
Skills	dk3-1	dk3-1	dk3-1	dk3-2	dk3-2		di5-1	di2-1	di5-1	di2-1	di2-1		dp1-2	dp1-1	dp1-2
	Knowledge &Understanding Skills						Intellectual Skills						Professional Skills		