



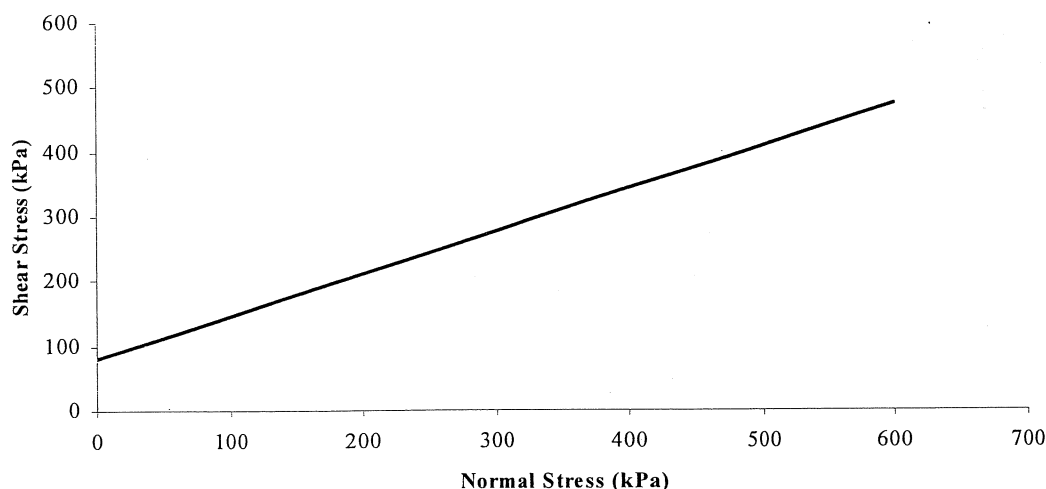
**The Open University of Sri Lanka**  
**Faculty of Engineering Technology**  
**Industrial Studies (Agriculture) Program of Study**  
**Final Examination – 2014/2015**  
**AEI3235 Land & Soil Tillage Management**

Date : 09/09/2015  
 Time : 09.30 a.m. – 12.30 p.m.  
 Duration : Three (03) hours

Registration number: .....

**Section 02 – Answer any four (04) out of the six (06) questions. You may use answer books and/or sheets to answer this section.**

- 1) A soil sample contains 45% solids, 31% water, and 24% water. The dry mass and the volume of the soil sample are 385 g and 320 cm<sup>3</sup>, respectively.
  - a) Calculate the dry bulk density and dry particle density of the soil sample.
  - b) Briefly explain how the bulk density values differ between a compacted and a non-compacted soil.
  - c) Briefly discuss the effects of soil compaction on plants.
  
- 2) A student performed the direct shear test to determine the failure of a soil sample. He collected data for the normal stress and the shear stress, and plotted the graph shown below.



- a) Write down the Mohr-Coulomb equation.
- b) Define the term “Cohesion” and determine the cohesion among the soil particles.

- c) Graphically illustrate the relationship between the horizontal displacement and shear stress in soil.
- d) Define the term “Soil Bulk Strength” and explain how it varies with the soil moisture content.
- 3) A land leveling survey is conducted to determine heights along a land, which has the following points: X, A, B, C, and D. The automatic level is placed between Points X and A. The staff is placed at each point, and the respective back sight (BS), intermediate sight (IS), and fore sight (FS) readings are obtained. BS reading when the staff is at Point X is 2.343 m, and the IS readings for Points A, B, and C are 1.005 m, 1.347 m, and 2.052 m. FS reading for Point D is 1.878 m.
- a) Considering Point X, which is situated 225.0 m above mean sea level, as the bench mark, calculate the heights at Points A, B, C, and D.
- b) Explain how the tripod and the automatic level are leveled prior to using.
- 4) a) A depression that has a triangular cross-section lies along a flat land. It has a top length of 1.8 m and a maximum depth of 40 cm. If the width of the depression is 90 cm, calculate the volume of soil needed to fill up the depression.
- b) Briefly explain how land leveling can be carried out using laser land leveling technique.
- 5) Discuss the direct and indirect impacts associated with soil tillage.
- 6) Discuss the effects of acid sulphate soils on ecology, economics, and engineering aspects.