

## **CIEG320 SOIL MECHANICS STUDY TOPICS FOR EXAM II**

### **General**

You should fully understand and be able to calculate the following things.

For Exam II, you can have two sheets of notes (8.5" x 11") both sides. Other than these two sheets, the exam is closed-book and closed note.

You should bring a pencil/pen, calculator, straight edge and scale (ruler) for this exam.

Even though Exam II is focused on Chapters 8 and 9, basic soil calculations, such as density, effective stress, void ratio, etc will be necessary to solve the problems.

Note: For any problems involving calculation of stress increases from foundation loads that require nomographs, I will provide a copy of the nomographs with the exam. If you want to use the equations instead of the nomographs, then you will have to include them on your own note sheet.

Note: I will provide Fig. 9.3 showing the graph of  $Z$  vs.  $U_Z$  with  $T$  contours (depth factor  $Z=z/H$ ). If you want to use the table instead of the graph for your calculations, you will have to put the table on your note sheet.

### **Chapter 8**

Consolidation testing of clays: Fully understand the standard consolidation test and be able to reduce lab data to create a consolidation diagram (void ratio vs. vertical effective stress or log of vertical effective stress AND vertical strain vs. vertical effective stress or log of vertical effective stress).

Location of preconsolidation pressure using Casagrande Method.

Estimation of Compression Index ( $C_C$ ), Modified Compression Index ( $C_{C\epsilon}$ ), Recompression Index ( $C_R$ ) and Modified Recompression Index ( $C_{R\epsilon}$ ) from consolidation plots. Know conversion factor between the standard index and modified indexes.

Estimation of Coefficient of Compressibility ( $a_v$ ), Coefficient of Volume Change ( $m_v$ ) from appropriate consolidation plots.

Calculation of OCR.

Determine the Field Consolidation Curves for either overconsolidated or normally consolidated soils from a laboratory consolidation test.

For given soil deposit, calculate ultimate consolidation settlement for both normally consolidated and overconsolidated soil layers.

Calculate stress increase at any depth in soils directly under center of loaded foundation using the Approximate Method (2 to 1). For both strip footings and rectangular footings.

Calculate stress increase in soils at any location (horizontal and vertical) under either surface point loads or surface line loads.

Calculate stress increase at any location (horizontal and vertical) in soils under loaded rectangular footings (Boussinesq Method) using Method of Superposition.

Calculate stress increase at any location (horizontal and vertical) in soils under loaded circular footings.

Calculate stress increase in soils at any depth directly under the center of long embankments.

## **Chapter 9**

Understand why clays have a time-dependent nature during consolidation.

Calculate Degree of Consolidation ( $U_z$ ) at specific locations in a clay soil layer.

Understand the differences between double drainage and single drainage and how they affect the time calculations.

Calculate either excess pore pressures, effective stresses or void ratios at specific depths using ( $U_z$ ) and Time Factor (T).

Calculate settlements, times, etc. using the two empirical equations (9-10 and 9-11) involving the  $U_{AVG}$

Determination of the Coefficient of Consolidation ( $C_v$ ) from consolidation test data using either the Casagrande Log Time Method or the Square Root of Time Method.

Estimation of Secondary Compression Index ( $C_{\alpha}$ ) or Modified Compression Index ( $C_{\alpha\varepsilon}$ ) from either consolidation test data or charts. Note: I will provide charts if they are required.

Calculate secondary compression settlement.