

The University of Iowa
Department of Civil & Environmental Engineering
FOUNDATION ENGINEERING 53:139
Spring Semester 2000
Preview of First Midterm Examination
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The first midterm exam is planned as a take-home assignment which you'll have 48 hours to complete. **You are expected to complete the exam independently with no assistance from classmates.** The likely exam format will include both short answer questions and some problem solving questions. As it is a take-home exam, you are free to use any and all of your class notes, textbook, or other helpful reference materials. You are encouraged to study and prepare for the exam, because no help, beyond clarifying questions, will be provided during the exam period. The following suggestions are provided to help focus your study efforts.

Slope Stability Analysis

- Be very familiar with the different methods of slope stability analysis covered in Chapter 12 of Principles of Geotechnical Engineering. The major methods are: (a) infinite slope analysis, with and without seepage; (b) planar slope methods such as Culmann's; (c) mass methods such as the Fellenius-Taylor technique; and (d) methods of slices (there are quite a few).
- Know and understand the assumptions behind each of the major methods.
- Know what types of problems each of the major methods can and cannot be applied to.
- If given the needed graphs and equations, be able to compute the factor of safety for a given slope and soil conditions.
- For cohesive soils, know when one would treat the soil as undrained ($\phi = 0$) and when it would be treated as drained ($\phi > 0$).

Subsurface Soil Explorations

- Know what information would typically be required and/or desired from a SSE.
- For each piece of information desired, know the different exploration tests/methods which can be used to gain that information.
- In particular, know about the Standard Penetration Test, and how its results can be used.
- Know the general ideas behind geophysical methods.
- Know the basic rules of thumb regarding SSE's, such as how deep they should go, and how much they should cost in proportion to the total cost of a project.
- Understand the differences between disturbed samples and undisturbed samples, and what soil properties can be obtained disturbed and undisturbed samples.

Shallow Foundations

- If given the necessary formulas, tables, and charts, be able to calculate the bearing capacity and settlements of shallow foundations on different soil types.
- Know and understand how Terzaghi's bearing capacity equations were obtained. You will not be asked to derive Terzaghi's equations, but you should be able to explain how the bearing capacity problem is broken up into three sub-problems. Know the geometry of the assumed failure mechanism.
- Be familiar with the three helpful mechanisms (cohesion, surcharge, and soil weight/friction) that provide bearing stability for shallow foundations.

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- Be able to explain how the field plate load test can be used to estimate both bearing capacities and foundation settlements. In particular, understand how and why foundation size can cause scale effects with regard to plate load tests.

Mat Foundations

- Know what mat foundations are, and the different circumstances where they might be used as opposed to individual spread footings.
- Understand the idea of mat foundation compensation and why it is used.
- Be very familiar with the idea of subgrade moduli. Know how they are calculated or estimated, and understand the role of scale effects.
- Understand the basic difference between treatment of mat foundations as rigid and flexible. What are the factors involved?