

National Exams May 2011

04-Geol-B3, Site Investigation

3 hours duration

NOTES:

1. If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper, a clear statement of any assumptions made.
2. This is an OPEN BOOK EXAM.
3. Candidates may use any non-communicating calculator.
4. Questions have equal value. The grade for each question is given. It is suggested that the candidate proportion time based on the allocated value.
5. All questions require an answer in essay format. Clarity and organization of the written answer and any figures or sketches are important.
6. The examination has an overall value of 100 Marks: 4 questions consisting of 25 Marks each.

Marking Scheme

1. 25 marks total

- (a) 5 marks
- (b) 5 marks
- (c) 5 marks
- (d) 5 marks
- (e) 5 marks

2. 25 marks total

- (a) 15 marks
- (b) 10 marks

3. 25 marks total

- (a) 10 marks
- (b) 10 marks
- (c) 5 marks

4. 25 marks total

- (a) 5 marks
- (b) 5 marks
- (c) 5 marks
- (d) 10 marks

Value

25 Marks

Question #1

Answer the following questions as fully as possible:

5 Marks

a. What is a site investigation?

5 Marks

b. Why is it important to conduct a site investigation (state at least 5 reasons)?

5 Marks

c. What are the main components of a site investigation that would be included in the site investigation report? A diagram of the steps and how they are inter-related may help.

5 Marks

d. In terms of the execution of a site investigation, what steps would be conducted prior to the field, in the field and post-field?

5 Marks

e. What resources would one acquire during the desk study portion of the site investigation?

25 Marks

Question #2

During a site investigation, it is important to evaluate the in-situ soils that are present. As such,

15 Marks

a. What are the main broad categories associated with soils? What are some of the engineering risks associated with each soil type that you have identified?

10 Marks

b. What are the various soil sampling techniques and samplers that are used to acquire a soil sample (these should be the industry norm)?

25 Marks

Question #3

Testing is a large component of the site investigation. There are standard in-situ tests as well as laboratory tests that are/can be conducted as part of the site investigation. Answer the following as fully as possible:

10 Marks

a. List and describe the main in-situ testing techniques for soil. Describe each technique, its method, equipment used, effectiveness, limitations and the specific soil parameters (or properties) that can be obtained or inferred.

10 Marks

b. List and describe the main laboratory tests that are conducted for soil samples that are obtained in the field and brought back to a laboratory for assessment/testing. Describe each technique, its method, equipment used, effectiveness, limitations and the specific soil parameters (or properties) that can be obtained or inferred.

5 Marks

c. Figure Q3 depicts results from a CPT test. What engineering advice can you provide given these results?

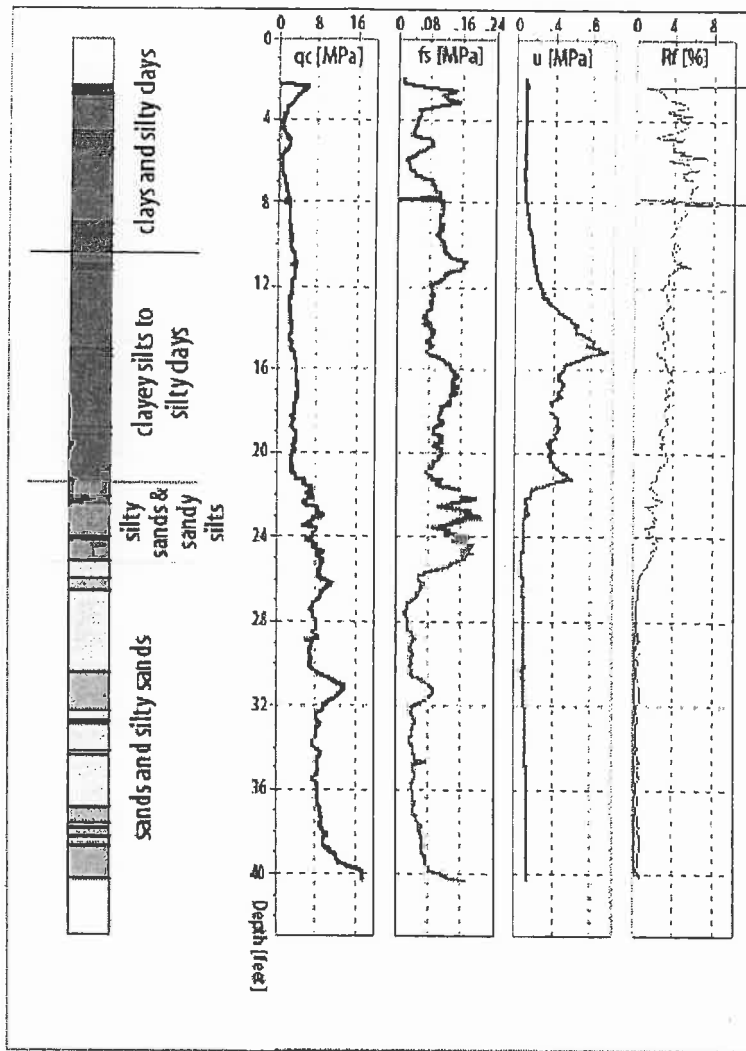


Figure Q3. CPT results from in-situ soil tested.

25 Marks

Question #4

Rock and Groundwater are also critical factors in foundation design and construction. Many infrastructure-related problems stem from poorly characterizing rocks and groundwater.

5 Marks

a. How are rock types and rock formations determined in the field? What are the multiple techniques available to the Engineer?

5 Marks

b. How can one determine the strength of rocks in the field or with laboratory testing techniques?

5 Marks

c. What are the main factors of importance when conducting a groundwater investigation?

10 Marks

d. How would one go about organizing a physical investigation of groundwater? What type of equipment would be required? What factors must be considered in the set-up of one's borehole spacing and distribution?