

National Exams December 2013

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) 8 marks
- (b) 8 marks
- (c) 4 marks
- (d) 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) 5 marks
- (e) 5 marks

Value

25 Marks

Question #1

It is important to realize how a site investigation is organized and how it is aligned within the field of engineering. All engineering structures interact with the earth. Therefore, the ground conditions constitute an important factor in engineering projects and they are influenced by a variety of factors.

8 Marks

a. Using a flow chart or organizational chart, outline the procedures that should be followed for the entire site investigation process. i.e. what are the main components and stages, who are the main players/experts, checks and balances, relationships between the client, engineer etc. The process should be logical from the beginning components of the site investigation process to the end product;

8 Marks

b. There are multiple disciplines and sub-disciplines that may contribute in-part to the overall, successful conduct of a site investigation. As such, the geotechnical engineer must have at the very least a basic appreciation of these specializations and to be as versatile as possible in order to effectively interact with these specialists. List and describe the contributions of at least 8 relevant specialists at the Engineering level (i.e. not to include technologists) that could be involved in a site investigation; and,

4 Marks

c. For a typical site investigation, what is the percentage of the project's total budget that is usually allocated for site investigation activities? What are the main repercussions of not getting the site investigation correct?

5 Marks

d. Address the main issues associated with the thoroughness of a site investigation, the budget allocated for the site investigation and the amount of risk to the project. Show how these factors are related and how they influence each other.

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

Groundwater is a critical factor in many engineering projects. Many infrastructure related problems stem from groundwater. Answer the following groundwater –related questions:

10 Marks

a. What are the main factors of importance when concentrating on the groundwater portion of the site investigation?

10 Marks

b. How would one go about organizing an on-site investigation of groundwater? What type of equipment may be required? What factors must be considered in the set-up of one's boreholes regime?

5 Marks

c. What is the function of piezometers in this context? When/where should they be installed within the context of a groundwater investigation?

25 Marks

Question #4

As an Engineer, your boss decides that you are the ideal candidate for a foundation construction project and she would like you to conduct the initial planning for the construction project. As a first step in this process, you are to conduct a desk study and subsequent site investigation.

5 Marks

a. State clearly the main objectives of your site investigation.

5 Marks

b. Once a scope of work has been determined for your project, what should the site characterization considerations entail?

5 Marks

c. What codes, guidelines, laws etc. (i.e. design / legislative framework) will you have to include as a consideration within your site investigation?

5 Marks

d. What are the primary objectives of the field exploration component?

5 Marks

e. In terms of reporting for your site investigation, what should the major headings of your report be?