

National Exams May 2016

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) 10 marks
 - (b) 10 marks
 - (c) 5 marks
2. **25 marks total**
 - (a) 5 marks
 - (b) 5 marks
 - (c) 5 marks
 - (d) 5 marks
 - (e) 5 marks
3. **25 marks total**

25 marks total answer
4. **25 marks total**
 - (a) 5 marks
 - (b) 5 marks
 - (c) 5 marks
 - (d) 10 marks

Value

25 Marks **Question #1**

A committee has been commissioned in order to construct a building within the city limits. As an Engineer that is sitting in at the meeting, your boss asks you what you believe a site investigation should entail. Describe in detail your response to how you would go about planning and designing a site investigation for this project.

10 Marks a. What would be the major site investigation topics that you would cover? i.e. What would be the major headings that would be summarized in the final geotechnical / site investigation report?

10 Marks b. Propose what resources you would require to conduct the site investigation and where you could potentially find such resources.

5 Marks c. What would the costs associated with such an investigation be? i.e. What percentage of the overall budget should the site investigation be?

25 Marks **Question #2**

On a particular site, there is a requirement to conduct a site characterization as part of the site investigation. As such, a determination of the in-situ geo-materials is imperative. State the type of in-situ activities (type of drilling, sampling and testing) that you would conduct in order to determine the classification and attempt to determine the properties of the following materials (materials that according to your desk study you believe will be on-site):

5 Marks a. Course-grained Soil;

5 Marks b. Fine-grained Soil;

5 Marks c. Hard Rock;

5 Marks d. Weak Rock; and,

5 Marks e. Peat and Organic Material.

25 Marks **Question #3**

Laboratory testing may be an integral part of your site investigation. As such, state 5 common laboratory tests that are used in at the stage of the site investigation. List the test, the reason for the testing, test for which specific conditions, describe the test, discuss how the results of the test aid in the site investigation, and list the advantages and disadvantages of each test. (5 Marks per technique).

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 orientation of stress in rocks? Explain why this is important from a site investigation perspective.
- 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?