

National Exams May 2015

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

Value

25 Marks

Question #1

As an Engineer at ABC Engineering Inc, your boss decides that you are the ideal candidate for a road 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. What references (or sources of information) would you cite first in order to start your study?

5 Marks

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

5 Marks

c. How will you include geotechnical risk in your site investigation?

5 Marks

d. What strategies will you employ in order to mitigate risk?

5 Marks

e. What will be the major objectives of the field exploration component?

25 Marks

Question #2

During a site investigation, it is important to evaluate the in-situ soils as well as rocks that that are (or may be) present. As such,

5 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?

5 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)?

5 Marks

c. What are the main broad categories (or geological models) associated with rocks? What are some of the engineering risks associated with each rock type that you have identified?

5 Marks

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

5 Marks

e. How does one determine the engineering properties of a soil or a rock?

25 Marks **Question #3**

List and describe the advantages and disadvantages of at least 5 industry norm in-situ soil testing techniques versus laboratory testing in order to obtain parameters of interest during the site investigation stage of a project.

25 Marks **Question #4**

Groundwater is a critical factor in underground as well as foundation design and construction. Many infrastructure related problems stem from groundwater, hence groundwater conditions, both physical and chemical are an important component of any site characterisation. Answer the following groundwater –related questions:

- 10 Marks a. What, specifically, are the geomechanical mechanisms of interest that are associated with groundwater and its influence on the ground conditions? .
- 5 Marks b. What are the main factors of importance when setting-up and conducting a groundwater investigation?
- 5 Marks c. 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?
- 5 Marks d. When should piezometers be installed and what are their function within the groundwater investigation?

End of Examination