00082

The Open University of Sri Lanka
Faculty of Engineering Technology
Department of Civil Engineering

Study Programme	: Bachelor of Technology Honours in Engineering
Name of the Examination	: Final Examination
Course Code and Title	**: CVX5532 Engineering Geology**
Academic Year	: 2020/2021
Date	: 05th February 2022
Time	: 1400-1700 hrs
Duration	: **3 hours**

General Instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of **Eight (8)** questions in **Three (3)** pages.
3. Answer any **Five (5)** questions only. All questions carry equal marks.
4. Answer for each question should commence from a new page.
5. This is a Closed Book Test (CBT).
6. Answers should be in clear hand written.
7. Do not use red colour pen.

Q1. Textural features of a rock are a major factor in determining the mechanical behaviour during the load applications.

(a). State the basic textural features of the following rock types;

(i) Igneous rocks (3 marks)

(ii) Sedimentary rocks (3 marks)

(iii) Metamorphic rocks (3 marks)

(b). Discuss the possible impacts of above-mentioned textural features on the ***deformation behaviour*** of rocks under the following loading conditions in the given rocks.

(i) Telecommunication Tower Foundation on a Limestone rock (6 marks)

(ii) Bridge Pier founded on a sloping Biotite Gneiss rock abutment (5 marks)

Q2. Engineering behaviour of a natural rock body is more dependent on its constituent structural features than to its textural features.

(a). Critically evaluate the above statement with respect to a metamorphic rock body. (10 marks)

(b). Discuss on the stability of the following structures constructed on the respective geological formations.

(i) Stability of a road constructed on a slope, where joints dip into the slope (5 marks)

(ii) Dam located on a rock formation, in which joints dip towards the downstream of the proposed reservoir (5 marks)

Q3. Write short notes on the following:

(a). Folds (4 marks)

(b). Body Waves used to discover the interior of the Earth (4 marks)

(c). Geological Time Scale (4 marks)

(d). Physical identification of Minerals (4 marks)

(e). Silicate Minerals (4 marks)

Q4. Geotechnical engineers need to consider the engineering behaviour of a Rock Mass, when carrying out a construction on or inside a rock mass

(a). Name Five (05) common ***Forms of Discontinuities*** encountered in rock masses. (3 marks)

(b) Briefly describe three (03) ***in-tact rock*** classification systems. (5 marks)

(c). Suppose you have been appointed as the Geotechnical Engineer for a rock tunnel construction project.

(i) Name three (03) most important ***in-situ tests*** that need to be carried out when constructing a tunnel in a rock mass providing with reasons. (3 marks)

(ii) Propose the ***most suitable rock mass classification system/s*** to be adopted in different stages of the said project. (9 marks)

Q5. The factors such as rock texture, structure, weathering and erosion alter the groundwater potential of a particular rock mass.

(a) Discuss on the impacts of weathering on rock texture and structure. (8 marks)

(b) Explain how the rock texture and structure facilitate the occurrence of groundwater in the three (03) major rock types. (7 marks)

(c) Briefly describe how the groundwater potential of a particular rock could be enhanced or diminished due to the impacts of weathering (5 marks).

Q6. Ground settlement and subsidence problems are common for most of the construction projects.

(a). Name ***five (05)*** common geological formations where, ground settlement and subsidence problems are possible. (5 marks)

(b). Describe the engineering properties of these rock formations where the settlement and subsidence is common and the possible areas where such problems can be commonly encountered in Sri Lanka. (10 marks)

(c). Propose five (05) different ground improvement techniques that can be used to improve the engineering properties mentioned in Q6(b). (5 marks)

Q7. Adopting the most appropriate sampling technique/s is crucial during a geotechnical investigation programme.

(a). Discuss about the different categories of soil sampling techniques and the laboratory applications of the same. (6 marks)

(b). Tabulate ***different types of soil samplers*** against their most appropriate application on ***different types of soils*** encounter in the field. (8 marks)

(c). Briefly discuss about the ***different rock sampling mechanisms*** used in ~~such~~ investigations and their specific applications based on the ***conditions of the rock***. (6 marks)

Q8. Effective planning of geotechnical investigation programme is essential to obtain accurate and sufficient geotechnical parameters within the budgetary limits.

(a). List the activities that will need to be performed during the preliminary and detailed stages of a geotechnical investigation programme. (5 marks)

(b). Briefly discuss how the appropriate use of different geotechnical investigation techniques can minimise the work listed under activities mentioned in (Q8(a))(10 marks)

(c). Explain the possible cost impacts of the above-mentioned strategies in (Q8(b)) and their impact on the accuracy of the obtained geotechnical data. (5 marks)