THE OPEN UNIVERSITY OF SRI LANKA
Bachelor of Technology (Civil) - Level 5
CEX 5232 – Engineering Geology

FINAL EXAMINATION - 2005 / 06

Time Allowed: **Three (03) Hours**

Date: 2006 - 03 - 28 (Wednesday) Time: 0930 -1230 hrs

The paper consists of Eight (8) questions. Answer Five (5) questions.

(1)

(i) Give an account of composition and structure of the crust of the Earth. (5 points)

(ii) Briefly describe the different methods that have been used for determining the age of the Earth. (5 points)

(iii) Earthquakes occur frequently along plate boundaries. Comment on this statement. (5 points)

(iv) Write an account of the classification and origin of mountains. (5 points)

(2)

(i) Describe the different types of textures that you generally find in igneous rocks using examples. (4 points)

(ii) Discuss the suitability of igneous and sedimentary rocks as construction materials for engineering projects. (4 points)

(iii) The Thermal and Dynamic Metamorphic processes are two types of metamorphisms. Differentiate between these two types. (4 points)

(iv) Name three chemically formed sedimentary rocks and explain how the chemical sediments transform into sedimentary rocks. (4 points)

(v) The specific gravity of a substance is used in identifying minerals. Define specific gravity and explain how its determination helps in identifying certain minerals. (4 points)

(3)

(i) The ground water investigations are extremely important in arid (dessert) regions, where groundwater is scarcely available.

a. Show the various subsurface zones of groundwater existence using a labeled diagram. (4 points)

b. How would you locate a deep water well using the electrical resistivity method? (4 points)

c. Jaffna peninsula is mainly underlain by karstic carbonate rocks. With the use of a sketch describe the existence of ground water in such terrains. (4 points)

(5)

(ii) The selection of a scale for different types of maps is an important issue.

a. The choice of the scale of the base map is decided considering the purpose. Briefly describe this statement. (4 points)

b. State the suitable scales of engineering geological maps you recommend for the following purposes with reasons. (4 points)

For regional land use planning

To determine the landslide patch of a area

(6)

(4)

(i) The two main types of weathering of rocks of tropical regions are physical weathering and chemical weathering.

a. State and briefly explain the factors affecting the chemical weathering process. (8 points)

b. Explain why weathering profiles are important in Civil Engineering context. (3 points)

c. Briefly give physical changes that are apparent in rocks during the process of weathering. (3 points)

(ii) Draw a neat sketch showing the various soil horizons in a soil profile. (3 points)

(iii) State the factors that contribute to soil forming process. (3 points)

(5)

(i) Write a description on tectonic joints in rocks. (7 points)

(ii) A tunnel is to be driven through a folded layer of sedimentary rocks.

a. Give different types of folds using sketches. (5 points)

b. Explain how you will use Bienawaski Rock Mass classification system to assess the standup time of the tunnel. (6 points)

c. State the problems that you may encounter if the folded rock is highly shattered. (2 points)

(6)

(i) The abrasive or the accumulative coasts are the two prominent landforms in a coastal zone.

a. Give the stages of formation of accumulative coasts with sketches. (4 points)

b. State the measures that could be used to prevent coastal erosion. (4 points)

(ii) The number of different drainage patterns which nature provides could be seen on aerial photographs and maps.

a. List and sketch four different drainage patterns. (4 points)

b. Discuss the geological conditions attributed to two types of drainage patterns listed above. (4 points)

(iii) Describe briefly the youthful stage of a land using geological features. (4 points)

(7)

(i) A road is to be constructed from the hill capital city to its commercial capital. The first part of 120km route is through a hilly terrain and then the latter part is through the low-lying coastal plain.

a. Discuss briefly the various engineering geological considerations involved in the execution of the said project. (8 points)

b. Explain how the bedding planes, joint planes etc. contribute to different types of failures (e.g. Plane, wedge etc.). (4 points)

c. List the factors that may contribute to cut slope failures. (4 points)

d. If unstable slopes are encountered state the various methods that you would propose for cut slopes along the road. (4 points)

(8)

(i) Subsurface exploration is essential in all major civil engineering projects. Different methods are available to obtain information about subsurface. Under what conditions would you recommend to use following geotechnical methods?

a. Trail Pits (3 points)
b. Wash Boring (3 points)
c. Rotary core drilling (3 points)

(ii) In a dam construction project, a sound rock formation would form the foundation riverbed. As part of the investigation, pressuremeter tests were conducted at different depths in boreholes drilled in the rock on the proposed dam axis.

a. Explain briefly how this test is conducted. (5 points)
b. State the parameters that could be obtained from the pressuremeter test. (2 points)

(iii) Explain why a variety of core barrels are available for rock sampling. (4 points)