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

FINAL EXAMINATION - 2006 / 07

059

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

Date: 2007 - 03 - 16 (Friday) Time: 1400 -1700 hrs

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

(1)

(i) Name the planets of the solar system and discuss briefly the most important planet Earth with respect to its origin. (6 points)

(ii) Describe about the internal composition of the Earth. (5 points)

(iii) Explain the use of radiometric dating technique in determining the age of the rocks. (6 points)

(iv) Give the conclusions that have been drawn with the help of radiometric dating techniques regarding the age of the earth. (3 Points)

(2)

(i) Explain various forms in which plutonic igneous rock masses occur in nature. Illustrate your answer with sketches. (5 points)

(ii) Sedimentary rocks are the most widespread over the surface of the earth. Describe the mode of formation of a common sedimentary rock and its engineering properties. (5 points)

(iii) Give a detailed account of different processes of metamorphism, on the basis of controlling factors and environment. (5 points)

(iv) Describe the Mica group of minerals with special reference to their physical properties. (5 points)

(3)

(i) Differentiate between the following:

a. Meteoric water and Connate water (3 points)

b. Confined and unconfined aquifers (3 Points)

c. Stalactites and stalagmites (3 Points)

(ii) Shafts are sunk at A, B and C to a Graphite seam. At A the seam is 500m from the surface and at B and C 400m from the surface. Refer Fig. 1 on page 5.

a. Find the dip angle, direction of dip and strike of the Graphite seam. (7 points)
b. Explain how engineering geological maps help in site investigation. (4 points)

(4)

(i) Write an account on 'Defects of the crystal structure of minerals and effects on these on engineering quality of rock' (6 points)

(ii) For many engineering purposes a solid and as near as possible continuous rock core is required. The consistency of rock core obtained from a drilling process is given below for a run of 150 cm. The length of core pieces in cm: 4, 5, 8, 7,10, 12, 4.5, 13, 17.5,10, 27.

a. Compute Core Recovery and Rock Quality Designation (5 points)
b. Describe how RQD expressed in percentage could be used to assess the quality of the rock mass. (3 points)
c. Describe the method of rotary core drilling operation, which will provide you the above results. (3 points)
d. List the methods that could be used to stabilize boreholes. (3 points)

(5)

(i) The marine erosion of coast resulting in the loss of land and property in Sri Lanka is a serious problem we are faced with.

a. Discuss the ways in which marine erosion is caused. (4 points)
b. To combat and lessen erosive action various coastal protection measures can be utilized. State the measures that can be utilized to protect the coastal belt of Sri Lanka. (4 points)
c. Briefly comment on the different types of sea waves (4 points)

(ii) Explain in detail the geological work of rivers giving examples of topographical features of great importance developed due to river erosion and river deposition. (8points)

(6)

(i) Central hill slopes of Sri Lanka suffer from different types of mass movements / wasting of earth and rock as an environmental geotechnical problem.

a. List some of the names applied to different types of mass wasting of soil / rock. (2 points)
b. On which factors do you think that they tend to differ? (4.5 points)
c. Give causative factors of mass movements. (4.5points)
d. Identify and sketch the different potential modes of failures in mass movements of earth and rock. (4.5 points)
e. Comment on formation of clays due to chemical weathering and occurrences of landslides. (4.5points)

(7)

(i) A developer wishes to develop a plot of land to build a housing complex. The borehole investigation revealed that the topsoil at the site is a fill comprising layers of sand and silts with gravel. Thickness of this fill varies from 3.0 to 3.5 m. Underlying this fill a very soft compressible layer of peat, which extends down to a depth of 4.5 m. Beyond this a clay layer extending down to a depth of 23 m up to the bedrock level.

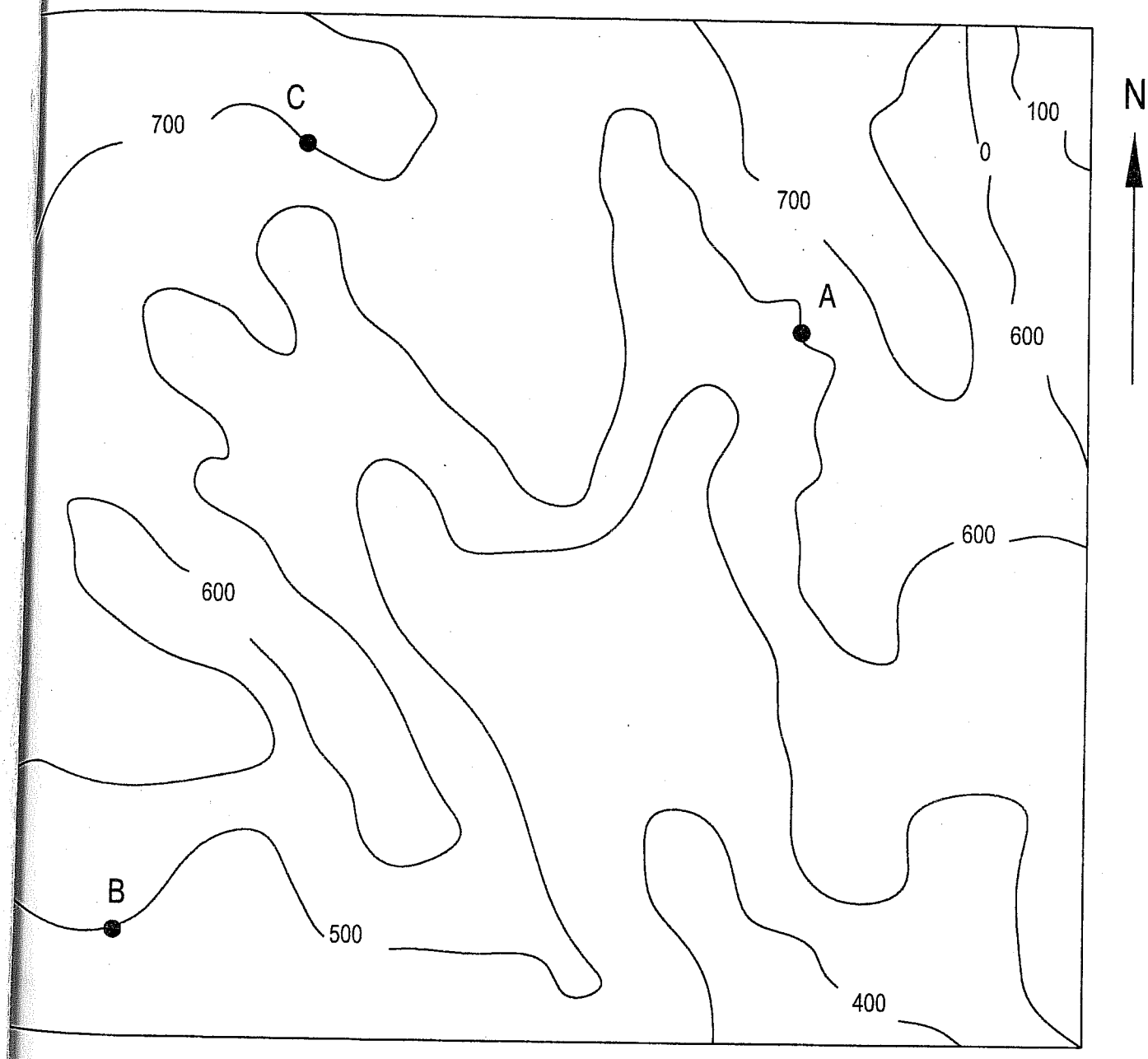
a. Describe how you would conduct the site reconnaissance survey. (3 points)
b. Discuss briefly the various engineering geological considerations involved in the execution of the said project. (5 points)
c. Considering the given site above, give a brief site investigation programme. (5 points)
d. Describe a suitable insitu testing to design a safe foundation for the above building. (4 points)
e. Explain why peaty soils are considered unsuitable as subsurface material in construction sites. (3 points)

(8)

(i) The government of Sri Lanka is hoping to get World Bank funding to build a rock fill dam and create a water supply reservoir in Bandarawela. The valley floor is thought to be covered by nearly 10 m of alluvial material. The valley is about 50m wide and 20m deep overlying on high-grade metamorphic rocks. The linear nature of the valley makes the consultant engineering geologist think that it may be fault controlled.

a. Discuss the geological considerations relating to the construction of a rock fill dam. (4 points)
b. What are the practical advantages of geophysical methods in dam site investigations? (4 points)
c. List out the observations that are made during drilling operations for geological investigations at the proposed dam site. (4 points)
d. Write a short note on possibility of reservoir-induced earthquakes after constructing the reservoir. (4 points)
e. State the properties of rocks that would provide an ideal material for dam foundations. (4 points)

Please attach this to your answer script.



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