THE OPEN UNIVERSITY OF SRI LANKA

Bachelor of Technology (Civil) - Level 5

CEX5232 – Engineering Geology

Final Examination –2014/15

Date: 04-08-2015 (Tuesday) Time Allowed: Three (03) hours

Answer Five (05) questions out of Eight (08) questions.
Answers should be illustrated with sketches and diagrams with assumptions stated, clearly and neatly

(Q1) Around one fifth of the Sri Lankan subsurface is occupied by sedimentary rocks.

(i) Giving some examples, classify sedimentary rocks. *(08 marks)*

(ii) Write down and explain briefly about the factors (**at least 03 factors for each case**) that should be considered when carrying out constructions under following aspects, which will be in or on a sedimentary rock formation.

(a) Placing a bridge pier foundation in a river *(03 marks)*
(b) Placing a Telecommunication tower/Chimney foundation *(03 marks)*
(c) Tunnel boring inside the rock mass *(03 marks)*
(d) Dewatering foundation excavations for constriction *(03 marks)*

(Q2) Different kinds of weathering alter the properties of original rock mass.

(i) What is meant by "Mechanical Weathering" of rocks? Illustrate your answer with examples *(08 marks)*

(ii) Special weathering effects are produced due to weathering attacks on bedrocks. Write down **four (04)** such **weathering effects.** *(08 marks)*

(iii) Write down **four (04)** possible effects that may be expected if new road is to be constructed in a mountainous terrain over a heavily **exfoliated** bedrock mass terrain. *(04 marks)*

(Q3) Mountains can be defined as the high relief areas of the Earth's Crust.

(i) Write down **four (04)** types of such mountains. *(04 marks)*

(ii) Write down and briefly explain **three (03)** stages of an **Orogenic** Cycle *(06 marks)*

(iii) Discuss the Groundwater behavior around above mentioned mountains in Question (Q3)(i). *(10 marks)*

(Q4) "Rocks are aggregates of minerals". Therefore, weathering intensity of a particular rock has a great influence from the weathering characteristics of composed minerals.

(i) Write down **two (02)** factors which determine the rate of weathering of a particular mineral. *(04 marks)*

(ii) Briefly describe how **strength** and **solubility** of sedimentary rocks vary, depending on the **cementing materials** and **admixtures** present. *(08 marks)*

(iii) Briefly describe how **strength** and **stability** of igneous and metamorphic rocks vary depending on the rock **texture** *(08 marks)*

(Q5) Discontinuities play a major role in strength and deformability of rock masses.

(i) Describe the types of discontinuities that are created in igneous rocks during the origin of rock mass *(05 marks)*

(ii) Explain the difference between In-tact and Rock Mass classifications and how these can be practically employed in construction. *(06 marks)*

(iii) Describe the possible geotechnical effects of joint orientations in surrounding rock masses for following construction activities with sketches if necessary.

(a) Tunneling *(03 marks)*

(b) Road construction in hilly areas using cut and fill method *(03 marks)*

(c) Dam and reservoir construction *(03 marks)*

(Q6) Subsidence of foundation structures is mainly occurs due to consolidation, collapse of cavities or landslides.

(i) Name **one (01)** such **soil** which creates large settlement levels due to consolidation and state **four (04)** main engineering characteristics of such a soil. *(06 marks)*

(ii) Name **four (05)** factors which favor the natural formation of underground caverns and cavities. *(10 marks)*

(iii) Name **two (02)** areas in Sri Lanka where there is a vulnerability of occurring ground subsidence due to collapse of underground caverns / cavities. *(04 marks)*

(Q7) Effects on earthquakes in civil engineering structures are greatly depend on the subsurface geological conditions of the particular area.

(i) Name **four (04)** engineering geological conditions that significantly influence the intensity of seismic activities. *(08 marks)*

(ii) Name **four (04)** special remedial measures that can be made to minimize the seismic effects, if a building construction to be carried out in a seismically active area. *(08 marks)*

(iii) Name **two (02)** design alterations that can be made to minimize the seismic effects, if a road embankment to be carried out in a seismically active hilly terrain. *(04 marks)*

(Q8) (i) Name **four (04)** factors that should be considered when selecting a particular subsurface boring method. *(04 marks)*

(ii) Name **four (04)** borehole stabilization methods. *(04 marks)*

(iii) Describe briefly about following in-situ tests. Your answer **must** include the **methodology** and the **parameters** that these tests provide.

(a) Pressure meter test. *(04 marks)*

(b) Field Soil Permeability test *(04 marks)*

(c) Field Rock Permeability test *(04 marks)*