UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 1 Examination in Engineering: July 2016

Module Number: CE 1301   Module Name: Introduction to Civil Engineering

[Three Hours]

[Answer all questions, each question carries TWELVE marks]

Q1. a) i)   What are the factors to be considered in selecting stations (or control points) for tape and offset surveying?

   ii)   While performing tape and offset survey operation in the field, a surveyor may come across an obstacle such as a building. In order to continue the survey operation, suggest a method that can be used for measuring distances across such obstacle, where both ranging and chaining are obstructed.

[1.0 Mark + 2.0 Marks]

   b) i)   Explain the purpose of 'Fly Back' in leveling survey.

   ii)   Explain the difference between Dumpy Level and Tilting Level.

[1.0 Mark + 2.0 Marks]

   c)   A nominal distance of 30 m was set out with a steel tape from a mark on top of one peg to a mark on top of another peg. The tape was in catenary under a pull of 160 N at a mean temperature of 30°C. The top of one peg was 0.511 m above the top of the other peg. Determine the horizontal distance between the marks on the two pegs.

   The tape was standardized in catenary under a pull of 130 N at a temperature of 25°C.

   Tape details:

   Cross-sectional area = 3.35 mm²

   Mass = 0.025 kg/m

   Coefficient of linear expansion = 11×10^{-6} per °C

   Young's modulus = 15×10^{4} MN/m²

   You may use the following equations:

   $$\text{Tension correction} = \frac{(P - Ps) \times L}{AE} \; ; \text{Sag correction} = \frac{W^2 \times L^3}{24P^2}$$

   $$\text{Temperature correction} = \propto \times L(T - Ts) \; ; \text{Slope correction} = h^2/2L$$

[6.0 Marks]

Q2. a) i) Giving examples, briefly discuss irrigation works in ancient Sri Lanka.

ii) Transportation engineering has always been one of the important civil engineering disciplines. Describe the role of transportation engineer with in civil engineering profession.

[1.5 Marks + 1.5 Marks]

b) i) State advantages of steel construction over concrete construction.

ii) Describe how following factors affect the strength of concrete.
'Quality of raw materials'
'Age of concrete'
'Compaction of concrete'

[1.0 Mark + 2.0 Marks]

c) A beam of length 4 m is simply supported at its ends. The shear force diagram under a certain loading system is shown in Figure Q2. Deduce the bending moment diagram and the loading system of the beam.
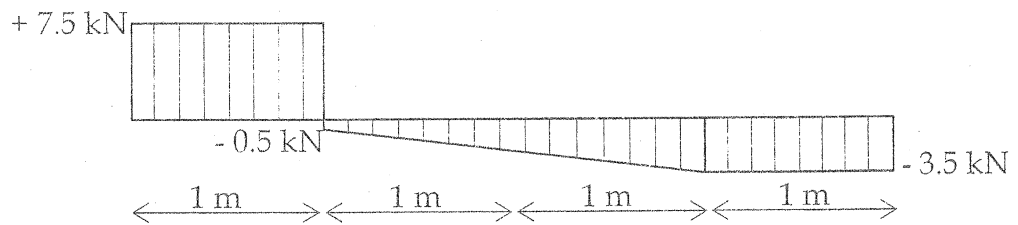

Figure Q2: Shear Force Diagram

Sign Convention
Clockwise shear : + (positive)
Anti-Clockwise shear : - (negative)

[3.0 Marks + 3.0 Marks]

Q3. a) i) State the factors that have to be considered in selecting a land to construct a residential building.

ii) What are the features of an aesthetically pleasing building?

[1.0 Mark + 1.0 Mark]

b) i) What are the functions of foundation?

ii) Explain the difference between shallow foundations and deep foundations.

[1.0 Mark + 1.0 Mark]

c) i) Describe the purpose of installing a Damp proof course (DPC).

ii) List the types of materials that can be used for DPC.

[1.0 Mark + 1.0 Mark]

d) i) Describe components of cold water installation for a domestic two-storey building.

ii) Accurate estimate of probable demand is essential for designing water supply piping systems in residential buildings. State factors contribute to the probable demand of water.

[1.5 Marks + 1.5 Marks]

e) i) What are the factors to be considered in installing the below-ground drainage to ensure efficient operation?

ii) Drain termination is an important design consideration for below-ground drainage systems. State methods of terminating below-ground drains.

[1.5 Marks + 1.5 Marks]

Q4. a) i) Name the four main types of transportation systems.
ii) Give example for each type.

[1.0 Mark + 1.0 Mark]

b) i) List reasons for traffic congestion.
ii) Explain how traffic congestion affects commuters, pedestrians and shippers (freight).
ii) According to the findings by World Bank, transport sector contributed 22% of global CO_2 emissions in 2010. Suggest methods to minimize transport related carbon emissions.

[1.0 Mark + 1.0 Mark + 2.0 Marks]

c) Highlighting four important aspects that the EIA report is based on, discuss briefly the importance of an Environmental Impact Assessment (EIA) report as a strategy for managing the environment.

[3.0 Marks]

d) Name two wastewater parameters for each of physical, chemical and biological characterization of a domestic wastewater sample.

[1.0 Mark]

e) Explain different types of solids found in both water and wastewater.

[2.0 Marks]

Q5. The Coastal Line is a major railway line in Sri Lanka, running between Colombo Fort and Matara, via Galle. The line is currently being extended to Beliatta and is proposed to be extended to Kataragama, via Hambantota. The proposed maximum speed for the extended line is 120 kmh^{-1}.

a) It is likely that the water bodies in proximity to the construction areas of the above project would be polluted due to some contaminants released by construction activities. Name two such pollutants and three adverse impacts that these pollutants impose on the water environment.

[2.5 Marks]

b) It is also likely that air pollution would occur during the construction phase of the above project. Name two air pollutants and two adverse impacts of each pollutant.

[2.0 Marks]

c) Name a primary environmental impact that is likely to occur during the operational phase of the proposed railway line. Explain how it may induce secondary, tertiary or higher order impact/s.

[2.5 Marks]

d) Explain briefly two engineering and two management approaches to reduce the soil erosion and siltation of surrounding water bodies during the construction phase of the above railway extension project.

[2.5 Marks]

e) Highlighting two features of the sustainable development, discuss briefly, how the proposed extension of the coastal railway line can be converted to a sustainable developmental activity.

[2.5 Marks]