



UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 6 Examination in Engineering: February 2020

Module Number: CE6301

Module Name: Construction Processes and Technology

[Three Hours]

[Answer all questions, each question carries twelve marks]

- Q1. Openings to buildings provide necessary ventilation and allow Sunlight in. Wood has been the traditional material used in making openings, however, extruded alloy sections are overtaking wood.
- a) It is needed to make a window opening on an already existing brick masonry wall. Identify the following related to this job
- i. Hand power tools needed and [1.0 Mark]
 - ii. Works expected from the identified tools [3.0 Marks]
- b) Explain how double pane windows prevent Sun's heat coming into the building by preventing heat transfer mechanisms. [3.0 Marks]
- c) List 6 ironmongery items used indoors or windows. [3.0 Marks]
- d) Explain with the help of neat sketches how wooden window frames and extruded alloy section windows are fixed into a brick masonry wall to form an opening. [2.0 Marks]
- Q2. Brick is a versatile construction material which has been used for a long time in the constructions of buildings. Concrete and cement blocks are seen as replacements for bricks in many applications, however, brick still holds a very vital role in masonry.
- a) List 4 main constituents of brick and explain their role in making a quality brick. [4.0 Marks]
- b) Draw neat sketches of queen closer, half brickbat, king closer, and mitre bat to illustrate the common use of them in the brick masonry construction. [2.0 Marks]
- c) Draw two consecutive layers of an English brick bond in "L" corner and "T" junction. [4.0 Marks]
- d) Briefly explain how the proportion of clay in a sand sample can be found on the site. [2.0 Marks]

Q3. ABC Construction (Pvt.) Ltd. has undertaken construction of a bridge in a rural area in the dry zone of Sri Lanka. Electricity needed for the site is obtained from a house located on the other side of the river using wires they had brought from their previous project. Since the area is located in rural area water connection was not obtained, instead, site management decided to use the river water for all needs. ABC construction (Pvt.) Ltd. had brought some gum-boots and hard hats for supervisors and site engineer. Since this project is in a rural area, fencing for the site was not provided. Further, workers were not provided with a toilet on the site. Workers were asked to use the jungle in the area for their toilet needs. Large earth-moving plants and one Derrick crane is used in the site in the construction process.

- a) Which party to the contract is primarily responsible for the health, safety and welfare of the site and what are the documents that govern the health and safety practices of a construction site?
[2.0 Marks]
- b) Identify hazards implied in the project stated in the paragraph above and corresponding risks associated with each of the identified hazards.
[3.0 Marks]
- c) Describe how these risks, identified in b) above, can be mitigated or managed.
[1.0 Mark]
- d) List 4 Personal Protective Equipment (PPE) that should be worn by the workers of the site and why each one of them should be worn.
[4.0 Marks]
- e) State Heinrich's law of near-accidents.
[2.0 Marks]

Q4. Setting out is the process where the features in a drawing are established in the ground.

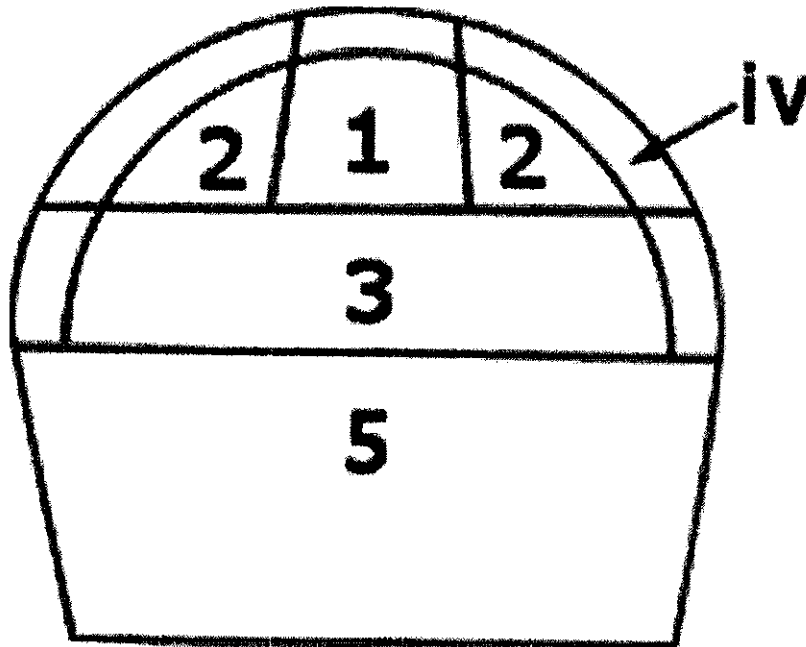
- a) Explain how 90° , 60° and 45° angles can be set out on a relatively flat ground using a measuring tape only.
[3.0 Marks]
- b) Explain how the coordinate system in the ground floor can be transferred to higher-level floors in a high-rise building
[3.0 Marks]
- c) Explain with the help of neat sketches how the side slopes of an embankment can be set out.
[3.0 Marks]
- d) Explain the factors that should be considered when setting out a dwelling unit.
[3.0 Marks]

Q5. Tunnelling below the groundwater table and in soft soil conditions have increased in recent years due to high demand in transportation need. 'Grout curtain' is a method that can be used to control the groundwater infiltration when tunnelling below the groundwater table.

- a) List potential socio-economic problems that might arise due to a tunnelling project.
[2.0 Marks]
- b) With the help of neat sketches, explain the working process of a full-face drill and blast tunnelling.
[3.0 Marks]

- c) Figure Q5.1 shows a scheme of working stages of a tunnelling operation. Draw the following based on the figure.
- Longitudinal section of the tunnel to show the different working stages indicated by numerals [2.0 Marks]
 - Distinctive cross-sections along the tunnel to show the different working stages indicated by numerals. [2.0 Marks]
- d) Explain two methods that can be used when tunnelling below the groundwater table. [3.0 Marks]

Figures



Note: Indo-Arabic numerals indicate excavations while roman numerals indicate lining.
 Figure Q5.1 Scheme of working stages of a tunnelling operation