



## **6720-550 Level 3 Constructing the Build Environment (Civil Engineering)**

**Version 1.0 – November 2017**

**Sample Questions Mark Scheme**

**1**

Name **two** standard formulae which can be used to calculate cut and fill quantities from section drawings. (2 marks)

**Answer**

Any **two** from the list below to a maximum of **two** marks.

- Simpsons Rule.
- Trapezoidal Rule.
- Mid-ordinate Rule.

The actual formulae will be accepted.

Test Spec Reference: 307.3.2 AO1

**2**

Explain **two** benefits for the use of software incorporated into total stations (4 marks)

**Answer**

Any **two** benefits from the following. **One** mark for a benefit and **one** mark for a linked response to a maximum of **four** marks.

- Reduced errors/increased accuracy (1) as a result of human error being eliminated/reduced in taking and recording measurements (1).
- Fieldwork time can be reduced (1) as it is a faster process and also allows for multiple surveys to be completed at one point (1).
- Easy to perform horizontal and vertical distance measurements (1) allowing simultaneous calculation of coordinates (1).
- Ease of use with follow up software such as CAD (1) as allows for daily survey information to be quickly downloaded into CAD which eliminates data manipulation time required using conventional survey techniques (1).

If learner only identifies **two** benefits, up to a maximum of **two** marks.

Test Spec Reference: 307.4.1 AO2

**3**

State **two** factors to be considered when designing axial loaded columns. (2 marks)

**Answer**

Any **two** factors from the following at **one** mark each, to a maximum of **two** marks.

- Selected material (timber, steel, concrete).
- Loading.
- Effective length.
- Moment of inertia of the section column.
- Cross-sectional area.
- Radius of gyration.
- Slenderness ratio.

Or any other suitable answers.

Test Spec Reference: 308.2.3 AO1

4

A timber column of rectangular cross-section is 150 mm wide and 250 mm deep.  
The maximum allowable bending stress must not exceed 6 N/mm<sup>2</sup>.

Determine the maximum bending moment in Nmm that the beam can safely carry. (4 marks)

**Answer**

Marks as allocated below:

$$Z = 150 \times 250^2 / 6 \text{ (1)} = 1\,562\,500 \text{ (1)} \text{ mm}^3$$

$$M = 6 \times 1\,562\,500 \text{ (1)} = 9\,375\,000 \text{ or } 9.375 \times 10^6 \text{ (1)} \text{ Nmm}$$

Test Spec Reference: 308.2.2 AO2

5

State **two** items of plant or equipment used in the construction of civil engineering superstructures. (2 marks)

**Answer**

**One** mark for each of the following to a maximum of **two** marks.

- Concrete pumps.
- Cranes.
- Hydraulic access equipment.
- Formwork.
- Falsework.
- Scaffolding.

Or any other suitable answer.

Test Spec Reference: 309.3.1 AO1

6

Explain the importance of the Construction (Design and Management) Regulations (CDM) in relation to civil engineering projects. (6 marks)

**Answer**

A coherent explanation that considers the relevance and importance of the CDM regulations, as applied to civil engineering projects. Marks as shown below, up to a maximum of **six** marks.

The aim of the CDM Regulations is to integrate health and safety into the planning, design and management of construction projects (1). It is intended to encourage everyone involved in a construction project to work together to (1); improve the planning, design and management of construction projects from the very start (1); Identify hazards early on, so they can be eliminated or reduced at the design phase (1) and the remaining risks can be properly managed during the construction phase (1); target effort where it can do the most good in terms of health and safety (1); discourage unnecessary bureaucracy throughout a construction project, from the planning phase onwards (1).

The objective should be to reduce the potential risk of harm to those who have to construct, maintain or demolish the structure, as well as to those who will use it (1).

Competent people should be appointed at the right time to plan, design, manage and monitor health, safety and welfare (1), and to encourage teamwork that focuses on effective planning and management of risks, rather than paperwork (1).

Test Spec Reference: 309.4.1 AO2

**7**

A builder has been asked to construct an external patio area at the rear of a domestic property. The area selected for the patio comprises well-drained land that slopes up to a height of 3.5 m in an irregular manner. The intention is to cut back the ground to provide the space required for the patio, and to support the remaining ground with a retaining wall. The builder intends to consult a civil engineer to determine the volume of soil to be removed, the dimensions and construction of the retaining wall and the preferred materials to use.

Discuss the factors the civil engineer must consider when presenting his or her recommendations. (12 marks)

**Indicative Content**

Cut and fill, Trapezoidal Rule, Simpson's Rule; active pressures, passive pressures, need for drainage (or not); rectangular, trapezoidal and cantilever retaining walls; possible modes of failure and how to prevent same; materials such as mass concrete, reinforced concrete, masonry.

**Band 1 (0-4 marks)**

The learner identifies a limited amount of the issues to be considered by the civil engineer, but there is little in the way of description. The learner's response lacks detail and is not clearly linked to the scenario.

**Band 2 (5-8 marks)**

The learner identifies a wide range of the issues to be considered by the civil engineer and supports this with brief descriptions. The learner's response is detailed but incomplete and has clear links to the scenario in most cases.

**Band 3 (9-12 marks)**

The learner identifies a comprehensive range of issues to be considered by the civil engineer and supports this with in-depth descriptions. The learner's response is detailed and complete and has clear and accurate links to the scenario.

Test Spec Reference: 307.3.2, 308.3.1, 308.3.2, 309.2.2 AO4