T-LEVELS | Institute for Apprenticeships & Technical Education

8710-032 MONTH 2022
T Level Technical Qualification in Building Services Engineering for Construction (8710)

Building Services Engineering Core (8710-30) – Theory exam (2) (8710-032)

If provided, stick your candidate barcode label here.

Date of exam (TBC)
Duration (2 hours 30 minutes)

Candidate name (first, last)

First

Last

Candidate enrolment number

Date of birth (DDMMYYYY)

Gender (M/F)

Assessment date (DDMMYYYY)

Centre number

Candidate signature and declaration*

- If additional answer sheets are used, enter the additional number of pages in this box. 0 0
- Before taking the examination, **all candidates** must check that their barcode label is in the appropriate box. Incorrectly placed barcodes may cause delays in the marking process.
- Please ensure that you staple additional answer sheets to the **back** of this answer booklet, clearly labelling these with your full name, enrolment number, centre number and qualification number in BLOCK CAPITALS.
- All candidates need to use a **black/blue** pen. **Do not** use a pencil or gel pen, unless otherwise instructed.
- If provided with source documents, these documents **will not** be returned to City & Guilds, and will be shredded. Do not write on the source documents.

***I declare that I had no prior knowledge of the questions in this examination and that I will not divulge to any person any information about the questions.**

You should have the following for this examination
- a pen with blue or black ink
- a non-programmable scientific calculator

General instructions

- The marks for questions are shown in brackets.
- This examination contains **28** questions. Answer **all** questions.
- Answer the questions in the spaces provided. Answers written in margins or on blank pages will **not** be marked.
- Cross through any work you do not want to be marked.

This exam has been split into **two** sections.
Below details the types of questions and marks available for each section.
Please allow time for each section accordingly.
Section A is made up of **77** marks and includes **25** short answer and medium answer questions.
Section B is made up of **33** marks and includes **3** extended response questions.

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Section A

1 State **two** environmental effects that can cause materials to degrade. (2 marks)

2 State the **two** factors, along with Force, used to determine the mechanical power required to move a load. (2 marks)

3 State **two** methods used to show the overall look of a building before it is built. (2 marks)

4 During an installation project at a new hotel, a refrigeration engineer is given a layout drawing to work from.

State **two** pieces of information that can be determined from a layout drawing for a new installation. (2 marks)

5 State the SI unit of measurement for **each** of the following.

a) Energy. (1 mark)

b) Temperature. (1 mark)

6 A circuit is to be extended that was wired using the older red and black live conductors.

State the current cable core colour that is matched to an existing black coloured conductor. (1 mark)

7 Explain **one** way 3D modelling could be used at the beginning of a construction project. (2 marks)

8 Describe **planned maintenance** and **reactive maintenance**, giving an example of each. (4 marks)

9 Describe the purpose of quality control in a construction project. (1 mark)

10 Give **two** examples of how construction companies can incorporate corporate social responsibility (CSR) into construction projects. (2 marks)

11 Explain the benefit of a limited company model with reference to liability protection. (2 marks)

12 Explain the difference between a short circuit and an earth fault, giving a description of **each** and a potential risk should **each** occur in a wiring system. (4 marks)

13 During the planning stage of a multi-discipline construction project, you are required to provide an estimated timescale of activities.

Describe how timescales are estimated for construction projects. (4 marks)

14 Explain how the convection cycle is used to transfer heat in a room. (4 marks)

15 You are part of the design team for an office refurbishment project. The client is unsure of the types of heating system they should have installed.

Describe **five** advantages which make convection heaters suitable for this project. (5 marks)

16 List **three** methods of how personal and financial data, relating to clients, can be kept secure when carrying to and from the worksite for accessing on a PC or tablet. (3 marks)

17 A 1:100 scale drawing of a new proposed building is to be produced on an A1 sheet of paper.

The dimensions of the building are 30 m wide x 50 m long.
An A1 sheet of paper measures 840 mm x 594 mm

a) Calculate the dimensions of the building width and length on the scale drawing.

Show your workings. (4 marks)

b) Stating the dimensions, what proportion in size is an A3 sheet when compared to the A1 sheet.

Show your workings. (2 marks)

18 Name **two** mechanical devices used within a centrally heated wet radiator system to automatically control the flow or pressure of the water. (2 marks)

19 List **three** building service engineering systems, together with their components, that would be supported on perforated metallic tray. (3 marks)

20 Calculate the energy required to raise a 20 kg mass to a height of 15 m. (1 mark)

21 Calculate the Power (work done) required to raise a mass of 50 kg to a height of 3 m in 30 seconds.

Show your workings. (2 marks)

22 A construction project is in the design stage. Four Refrigeration units are required to be installed in a space measuring height – 2340 mm, width – 5469 mm, depth – 1254 mm. These will not be standard units and therefore will need to be ordered in advance and manufactured to fit within the dimensions specified.

Explain which design and manufacturing process would be used and how it meets the requirements of this project. (3 marks)

23 Maintenance replacement work is to be undertaken in a large multi-storey office block over the course of three hours.

Identify **two** essential building services that would need assessing for risk to life, when removed for maintenance. Your answer needs to detail what the risk would be. (4 marks)

24 A potential customer is calling to enquire about a small job relating to control equipment that they would like undertaken by an organisation.

Explain how the process, from enquiry to completion, is dealt with by the organisation, in order for the work to be done efficiently and cost effective to the client. (6 marks)

25 A building services company is designing a new large domestic installation.
The property will consist of:

- A large 5-bedroom house
- Separate structure housing a furniture workshop
- Separate structure housing a gym and swimming pool.

The workshop structure is to have a separate sub-main installed.

a) Describe the advantages of using PVC/SWA as the supply cable for the workshop structure. (2 marks)

b) Explain how the construction of a PVC/SWA cable makes it a suitable design choice for the supply of the workshop structure. (6 marks)

Section B

26 The top two floors of a large office building have their water supplied by a set of two pumps.

Following a temporary interruption to the water supply, it has been discovered that one of these pumps had failed, leaving only one in service.

As a contractor who offers building services maintenance, you have been asked to investigate the failed pump. You discover blocked filters have caused the pump to seize. There are no isolation points on the supply pipework, meaning the cold-water service to the entire building will need to be isolated to enable the exchange of the pump.

Discuss the best course of action to replace the pump whilst minimizing disruption to the building, giving recommendations for what could be put in place to prevent this type of failure in the future. (9 marks)

27 You have been asked to be part of the design team for an electrical installation within an equestrian facility consisting of a main house, stables, garage, and outbuildings.

One of the outbuildings is to be converted into an indoor horse-riding show arena, offering audience seating and refreshment facilities. The distance between the existing mains board and the proposed sub-main is 20 m. The supply and installation is to form a three-phase TN-C-S, 400 V supply, with an Ib of 35 amps per phase, where Z_e is 0.35 Ω at the origin of the circuit. Protection for this circuit is by a Type C RCBO. The ambient air temperature is 30 °C with an ambient ground temperature of 15 °C.

Analyse the information provided and recommend a suitable wiring system and cable size for the sub main feed that complies with BS 7671. (12 marks)

28 You are working on an international construction project, with many colleagues from different countries.

Analyse the different types of measurement methods and discuss how the importance of communicating accurate measurements can impact on the project. (12 marks)

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