Candidate surname | Other names

Pearson BTEC Level 3 Nationals Extended Diploma

Centre Number

Learner Registration Number

Wednesday 12 June 2019

Afternoon (Time: 1 hour 30 minutes) | Paper Reference **20075K**

Construction and the Built Environment

Unit 1: Construction Principles

You must have:
a non-programmable calculator, a ruler and HB or 2B pencil to sketch, information booklet for Unit 1

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and learner registration number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need*.
- Show your working when requested.

Information

- The total mark for this paper is 75.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question*.
- You may use a non-programmable calculator that does not have the facility for symbolic algebra manipulation or allow the storage and retrieval of mathematical formulae.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question, showing all your working, use the appropriate units in your answers and always answer to an appropriate degree of accuracy.
- Check your answers if you have time at the end.

Turn over ▶

P 6 1 5 6 6 A 0 1 1 6

Pearson

Answer ALL questions.

Some questions must be answered with a cross in a box ⊠. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ⊠.

1

A contractor is constructing a new building for a college.

The building will include lecture rooms and open-plan spaces for students to socialise.

(a) The college has stated that it would like the materials used in the building to have low environmental impacts.

Identify the term used to describe the total amount of energy used to produce a construction material.

(1)

☒ **A** Kinetic energy

☒ **B** Embedded energy

☒ **C** Potential energy

☒ **D** Passive energy

(b) The lecture rooms need to meet certain acoustic performance requirements.

Describe what is meant by reverberation time.

(2)

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(c) **Figure 1** shows the dimensions of one of the college's lecture rooms.

Calculate the volume of the room.

(6)
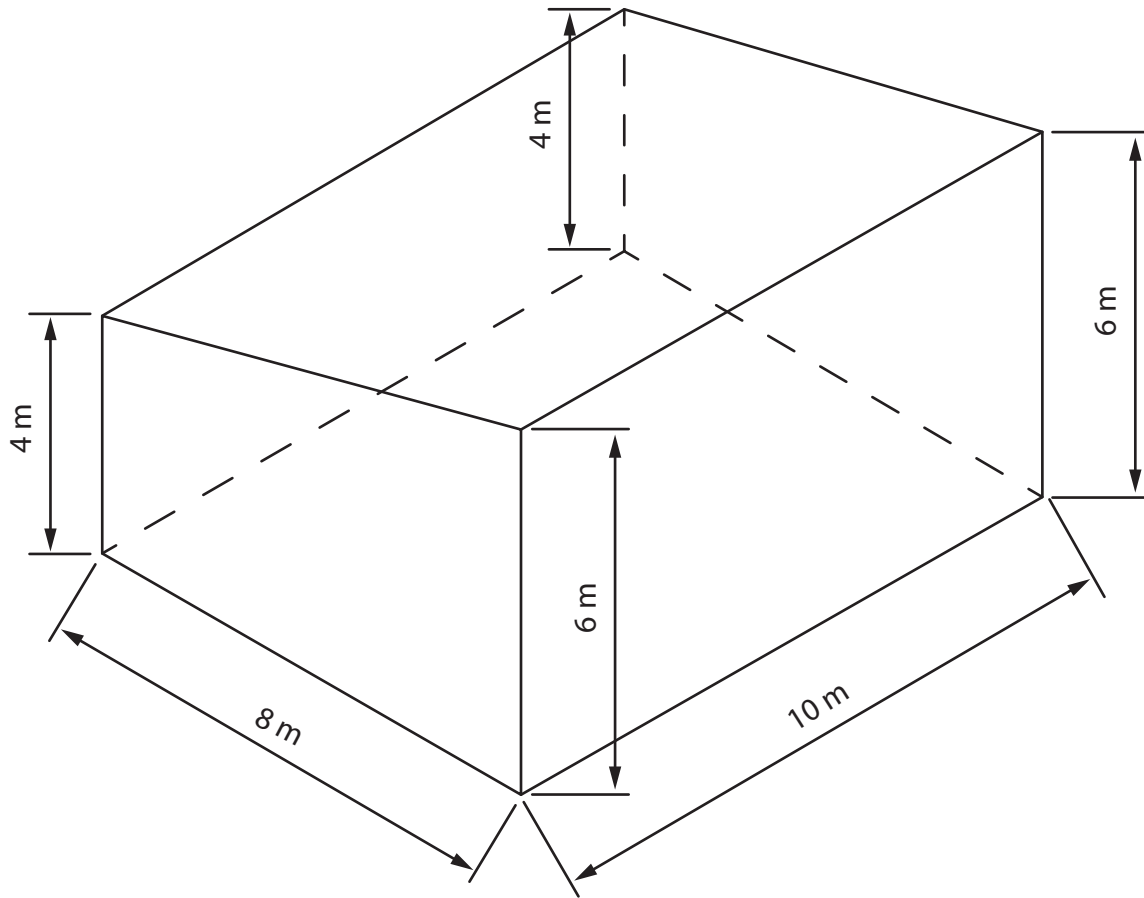
Figure 1

(d) The temperature of the lecture rooms will be controlled using a thermostat.

Explain **one** way a thermostat controls temperature.

(2)

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(e) Various areas of the building will have different acoustic requirements.

Explain **two** reasons for the need to consider 'noise criteria indices' when designing the new building.

(4)

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(Total for Question 1 = 15 marks)

P 6 1 5 6 6 A 0 4 1 6

2

A civil engineering contractor has been commissioned to build two new access roads to a power station.

The roads will require a number of other structures to be built, including retaining walls and concrete bridges.

(a) State **one** component of concrete.

(1)

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(b) The routes of the two roads have been plotted on a map and are represented by the simultaneous equations

$y = 2x - 8$

$y = x + 3$

Calculate the coordinates (x, y) of the intersection of the two roads by using an algebraic method.

You **must** show all your working.

(4)

(c) A retaining wall is to be constructed from brickwork.

Explain **two** ways in which brickwork can fail.

(4)

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(Total for Question 2 = 9 marks)

3

A health authority has appointed a contractor to refurbish the waiting and reception areas in a health centre. The waiting areas are used by patients before they see a doctor.

The waiting and reception areas will feature internal walls that are constructed from aerated concrete blocks. Large windows will be built into the walls.

(a) Explain **two** properties of aerated concrete blocks that make them suitable for internal walls.

(4)

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Figure 2 represents a lintel that supports the wall above a window.

UDL = 2 kN/m

2.5 m

R_A

R_B
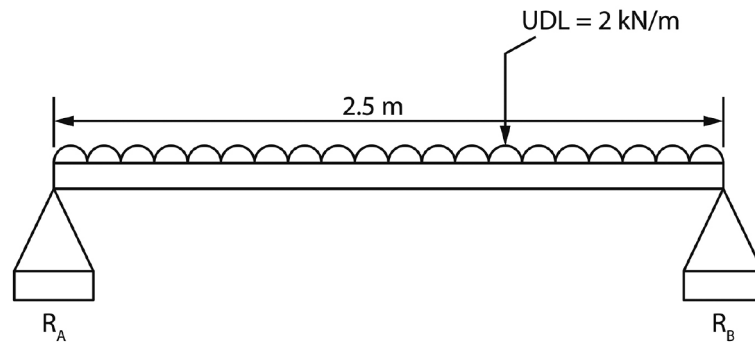
Figure 2

(b) Calculate the reaction force R_A.

(4)

(c) The health authority has specified that internal windows in the health centre should be obscured glass.

Explain **two** reasons why obscured glass is suitable in this situation.

(4)

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P 6 1 5 6 6 A 0 9 1 6

(d) The health centre has a mechanical plant room.

Analyse how applying the source-path-receiver approach can effectively prioritise methods of reducing noise to protect maintenance workers in the building.

(9)

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(Total for Question 3 = 21 marks)

P 6 1 5 6 6 A 0 1 0 1 6

4

A construction company has been contracted to build a leisure centre.

The leisure centre will have a sports hall, a swimming pool and a gym. There will also be changing areas and a snack bar.

The gym has LED lamps attached to the ceiling by 1500 mm long steel suspension cables.

(a) Suspension cables attached to the LED lamps extend by 5 mm.

Calculate the strain in **one** steel cable when a LED lamp is attached.

(2)

(b) The snack bar will be illuminated by fluorescent tubes.

Explain **one** disadvantage of using fluorescent tubes to illuminate the snack bar.

(2)

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P 6 1 5 6 6 A 0 1 1 1 6

(c) The contractor needs to make sure that the sports hall is kept at an appropriate temperature to provide comfortable conditions for users.

Explain **two** factors that contribute to heat gains in the sports hall.

(4)

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2 ....

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(Total for Question 4 = 8 marks)

5 You will need to refer to **Figures 3**, **4** and **5** in the information booklet to answer these questions.

> The location of new holiday homes is indicated by the letter **X** on the maps shown in **Figure 3**. The data shown in these maps indicates the mean maximum summer temperature and the average annual rainfall for the whole of the UK.
>
> **Figure 4** gives climatic information for the location of the site.
>
> The holiday homes will be a mixture of bungalows and two-storey houses.
>
> All buildings will be constructed using the same combinations of materials, including:
> * timber cladding
> * straw insulation
> * particle board framing
> * thatch roof.

Refer to **Figures 3** and **4** for climatic information for the development.

A construction company plans to build holiday homes in the location marked **X** on **Figure 3**.

The construction company plans to use thatch for the roofs.

(a) Explain **two** performance characteristics of thatch roofing that make it suitable for this location.

(4)

1 ....

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2 ....

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(b) The construction company wants the holiday homes to make best use of natural daylight by making sure the daylight factor is high.

Explain **three** ways in which the daylight factor inside the holiday homes could be maximised.

(6)

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3 ....

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Refer to **Figures 3** and **4** for climatic information.

Figure 5 shows the wall construction details for the holiday homes.

(c) Evaluate the combined use of particle board frames, timber cladding and straw insulation as materials for the external walls of the holiday homes.

(12)

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(Total for Question 5 = 22 marks)

TOTAL FOR PAPER = 75 MARKS