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1145-530 MARCH 2023

Level 3 Advanced Technical Certificate in Engineering

Level 3 Advanced Technical Extended Diploma in Engineering (720)

Level 3 Engineering – Theory exam (1)

If provided, stick your candidate barcode label here.

Monday 6 March 2023
09:30 – 12:30

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. 
- 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 non-programmable scientific calculator

General instructions

- Use black or blue ballpoint pen. Use pencil for drawing only.
- Any pencil drawings **must** be bold and clear for scanning purposes.
- The marks for questions are shown in brackets.
- This examination contains 13 questions. Answer **all** questions.
- You must show all your working on calculation questions.
- Write **all** of your working out and answers in this booklet.
- Answer the questions in the spaces provided.
- Answers written in margins or on blank pages **cannot** be marked.
- Cross through any work you do **not** want to be marked.



1 a) State the property of a material that means a material has the ability to return to its original shape after being stretched. (1 mark)

b) Define the term 'hardness' when referring to a material. (1 mark)

c) Describe a test used to measure the hardness of a non-ferrous metal. (4 marks)

2 Describe the stages of a process used to case harden low carbon steel.

(4 marks)

3 a) Explain the difference between a composite material and a metal alloy. (3 marks)

b) Explain **two** reasons why pre-preg fibre might be preferred to dry fibre when manufacturing a composite material. (4 marks)

4 Explain how electricity is conducted by a semiconductor material.

(6 marks)

6 a) Describe the steps required to blow form a plastic product using a supplied mould.

(3 marks)

b) Explain why a company may adopt a Kanban approach during production.

(5 marks)

7 An engineer is designing the body of an electric kettle similar to those shown in Figure 1. It is intended that the final product will be manufactured in large quantities.



Electric Kettles – Published Anonymously – Amazon.co.uk

Figure 1

Suggest a suitable specific material from which the body of the kettle could be made, giving reasons for your suggestion.

(4 marks)

8 a) State **two** different types of information that can be obtained from a customer design brief. (2 marks)

b) Explain the difference between subjective and objective design criteria. (2 marks)

c) Describe the purpose of a systems diagram. (2 marks)

d) i) Explain **two** benefits of making a functional prototype of a new product. (4 marks)

ii) Explain **two** limitations of making a functional prototype of a new product. (4 marks)

- 10 a) Multiply the following complex numbers:
 $(5 + 2j)(3 - 3j)$

(3 marks)

You must show all working.

- b) The cartesian vector $(45, 227)$ needs to be converted to polar form to allow a CNC machine to be programmed.

Carry out this conversion. Give your answers to one decimal place.

(4 marks)

You must show all working.

- c) The triangle in Figure 2 needs to be marked out for cutting. The area is known to be 9912.43 mm^2 .

Calculate the length BC. Give your answer to the nearest mm.

(5 marks)

You must show all working.

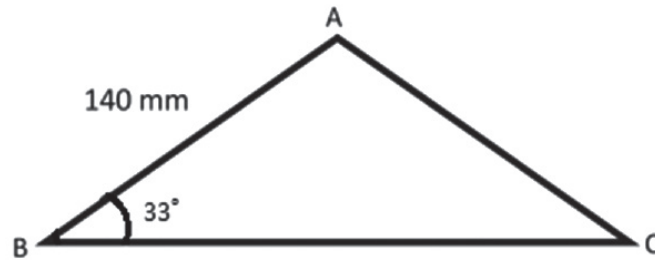


Figure 2 – NOT TO SCALE
