Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
TOTAL	

AQA

General Certificate of Secondary Education
June 2015

Engineering 48503

Unit 3 Written Paper

Monday 1 June 2015 1.30 pm to 2.30 pm

For this paper you must have:
- normal writing and drawing instruments.

Time allowed
- 1 hour

Instructions
- Use black ink or black ball-point pen. Use pencil only for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.
- All dimensions given in millimetres unless otherwise stated.

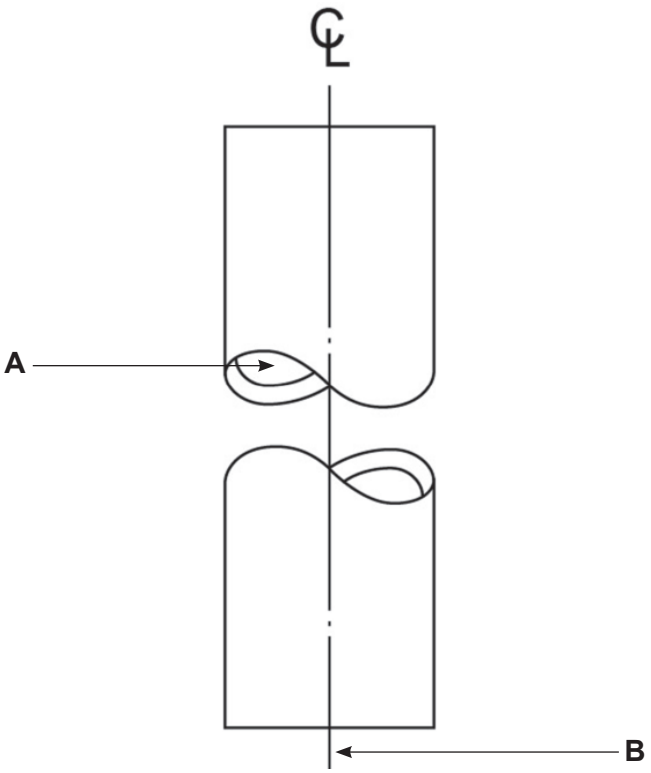
Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 75.
- You are reminded of the need for good English and clear presentation in your answers. Quality of Written Communication will be assessed in Question 2(a).

A

Answer **all** questions in the spaces provided.

1 (a) **Figure 1** shows a component drawn using British Standard conventions.

Figure 1



State the meaning of conventions **A** and **B**.

[2 marks]

A .....

B .....

1 (b) Engineering drawings contain a title block.
Give **four** items of information that a title block should include.

[4 marks]

1 .....

2 .....

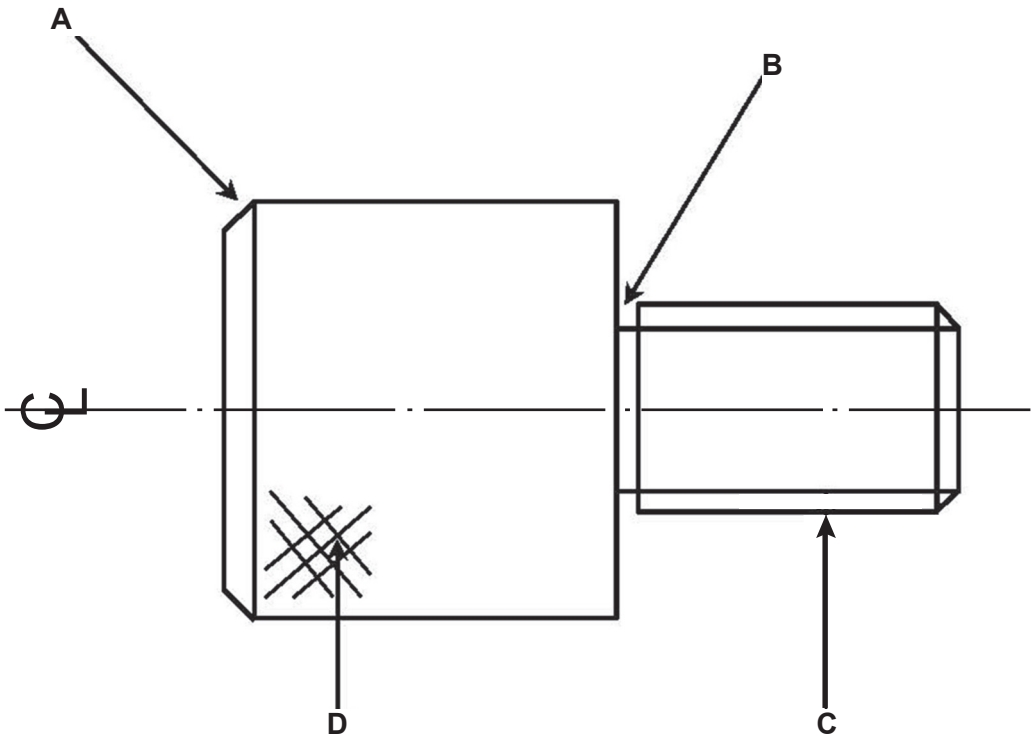
3 .....

4 .....

1 (c) Name the **four** features on the engineering drawing below.

[4 marks]

Figure 2



A .....

B .....

C .....

D .....

10

Turn over for the next question

2 Below is a design specification for an electric kettle.

The kettle must be:

- able to boil the contents in less than three minutes
- able to contain two litres of water
- safe to use
- energy efficient.

2 (a) Explain how the kettle could be tested to ensure it meets the design specification. Quality of Written Communication will be assessed in this question.

[6 marks]

2 (b) The switch used on the kettle is produced by a different manufacturer.
Give **two** reasons why the kettle manufacturer would buy the switch rather than make it. You should explain your answers.

[4 marks]

1 .....

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2 .....

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10

Turn over for the next question

3 An engineering company requires 500 identical components to be produced.

3 (a) State the name of a measuring device that a worker on the production line could use to immediately tell if the component is in tolerance or not.

[1 mark]

.....

3 (b) Use notes and sketches to show how this device would be used.

[4 marks]

5

4 **Figure 3** shows an electrically operated gate.

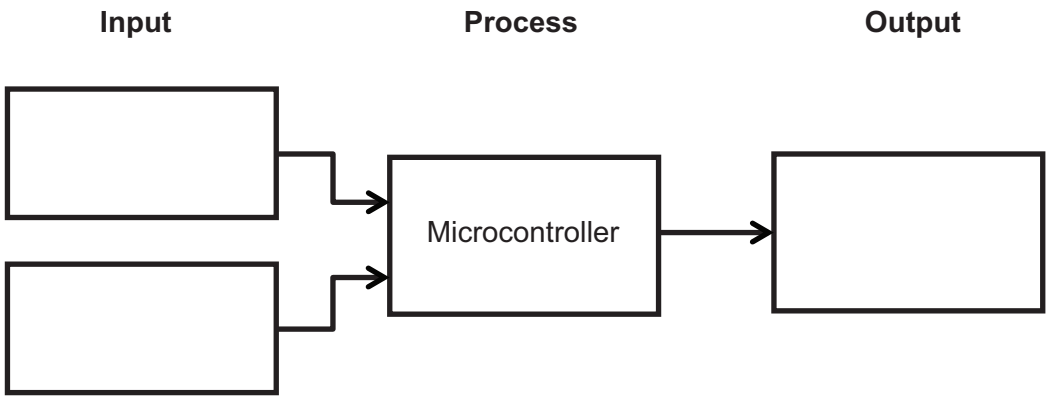
Figure 3

The gate has the following operational features:

- an electronic keypad which requires a combination to operate the gate
- a microcontroller
- a motor to open and close the gate
- a sensor to detect any obstruction.

4 (a) Complete the systems diagram below to show the operation of the gate.

[3 marks]

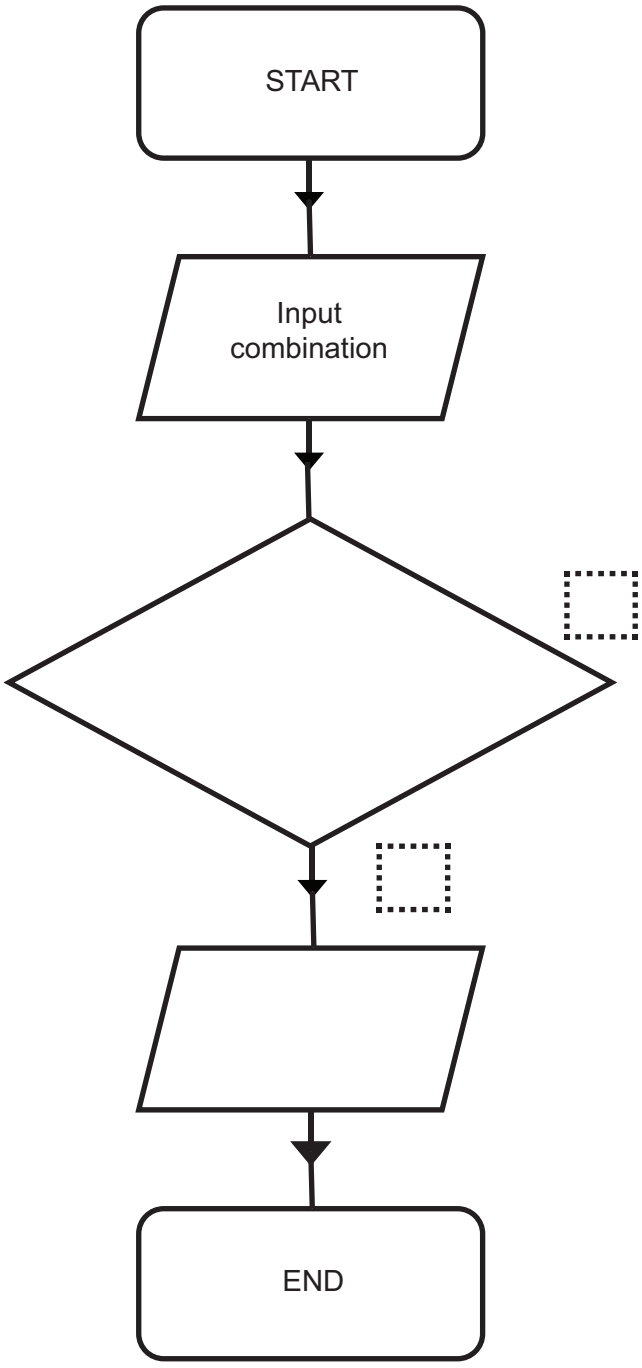


Question 4 continues on the next page

4 (b) Complete the flow chart below to show how the gate will open once the correct combination has been entered into the keypad.

[3 marks]

Keypad entry

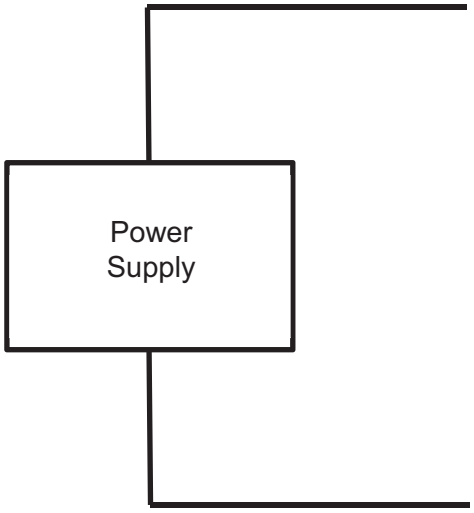


4 (c) The gate is to be fitted with a safety circuit which includes the following:

- a buzzer to alert users when the gate is closing
- a 'push to break' switch connected to the edge of the gate which will stop the motor if there is an obstruction.

Using the correct symbols, complete the circuit diagram below to show how the circuit would work.

[4 marks]



10

Turn over for the next question

5 (a) Explain the term 'smart material'.

[2 marks]

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5 (b) For each smart material below, describe its smart property and state an application where the material could be used.

5 (b) (i) Shape Memory Alloy (SMA)

[3 marks]

Property .....

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Application .....

5 (b) (ii) Quantum Tunnelling Composite (QTC)

[3 marks]

Property .....

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Application .....

5 (b) (iii) Thermochromic Ink

[3 marks]

Property .....

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.....

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Application .....

11

Turn over for the next question

6 (a) Give **two** benefits to a manufacturer of production planning.

[2 marks]

1 .....

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2 .....

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6 (b) Describe **two** ways in which the use of Computer Integrated Manufacturing (CIM) can assist in the production process.

[4 marks]

1 .....

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2 .....

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6 (c) Robotics are frequently used as part of the production process.
Give an example of where robotics are used in industry. Explain why robotics are used in this application.

[3 marks]

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9

7 (a) Energy costs in the manufacturing industry can be high.
Describe **three** ways a company can reduce its energy costs.

[6 marks]

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7 (b) Explain the term 'renewable energy'.

[2 marks]

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7 (c) Give **two** sources of renewable energy.

[2 marks]

1 .....

2 .....

10

Turn over for the next question

8 (a) Engineered products usually have a surface finish applied.
Give **two** reasons for applying a surface finish to a product.

[2 marks]

1 .....

2 .....

8 (b) A manufacturer of steel gates uses galvanising as a surface finish.
Describe how the gates would be galvanised.

[4 marks]

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8 (c) When applying surface finishes, risks to health and safety must be considered.
In the table below, identify **two** risks and give a control measure for each one.

[4 marks]

Risk	**Control Measure**

10

END OF QUESTIONS

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