Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

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

General Certificate of Secondary Education
June 2013

Engineering 48503

Unit 3 Application of Technology

Wednesday 22 May 2013 1.30 pm to 2.30 pm

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

Time allowed
- 1 hour

A

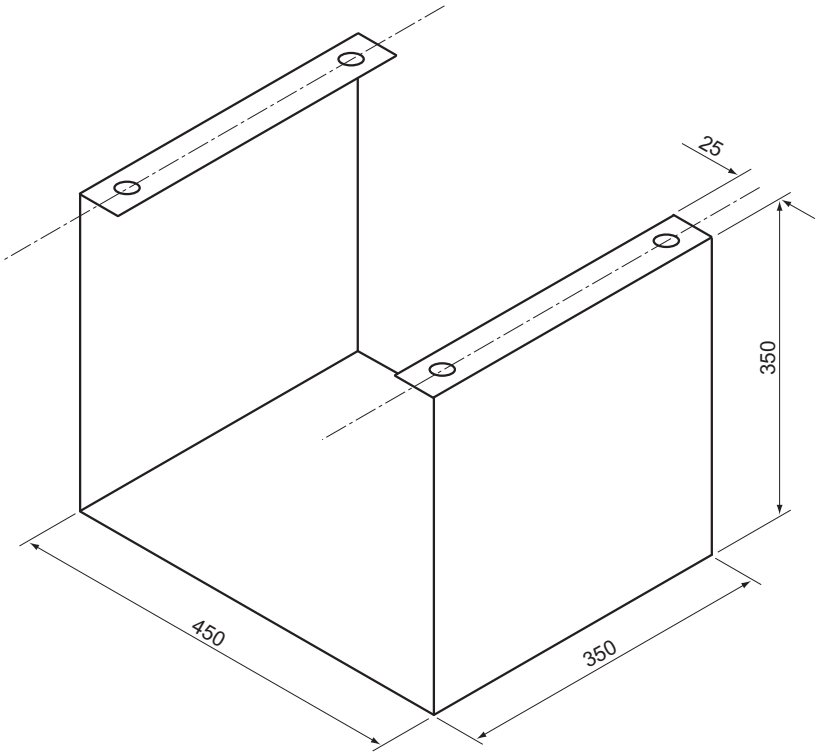
Instructions
- Use black ink or black ball-point pen. Use pencil only for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this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

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 8.

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

1 The drawing below shows part of a casing for a microwave oven.

Figure 1



Use the information in **Figure 1** to answer the following questions.

1 (a) (i) Give **two** reasons why Low Carbon (mild) Steel (LCS) has been chosen for this casing.

.....

.....

(2 marks)

1 (a) (ii) State the diameter of the holes in the casing shown in **Figure 1**.

.....

(1 mark)

1 (a) (iii) Draw the casing in **Figure 1** to a scale of 1:5 using third angle Orthographic Projection, in the grid opposite.
Show all **three** views.
Include **three** important dimensions. *(7 marks)*

1 (b) (i) The casing in **Figure 1** is to be made from a single piece of metal, 350 mm wide and bent to the required shape.
From the information given in **Figure 1**, calculate the total length required.
Show your calculations in the box below.

Total length required .....

(3 marks)

1 (b) (ii) Calculate the maximum number of casings that may be made from a standard LCS sheet of size 1.25m $\times$ 2.5m.

Show your calculations in the box below.

Total number of casings produced .....

(4 marks)

17

2 (a) The table below shows a Production Planning sheet for the manufacture of **one** microwave oven casing, as in **Figure 1** on page 2.

Op. No.	Description of task	Tools/Equipment required	Health and safety issues
1	Select one sheet 0.6 mm LCS and place on guillotine	Micrometer to measure sheet thickness	Use of steel reinforced gloves, overalls and boots
2	Set up guillotine guide rails to appropriate size and cut to outside shape de-grease and deburr	1 metre rule, guillotine	Isolate/padlock guillotine until after setting up completed.
3			
4			
5		Bending machine	
6	Inspect, check against specification/ drawing	Drawing, rule	Beware sharp edges

Indicate the correct statements needed to complete the table above, by using the letters **A** – **H**

A Drill 4 × Ø6 holes and deburr

B Bend to final shape

C Clamps, wooden support

D Beware of sharp edges and pointed tools

E Beware of trapping fingers

F Mark-out bend lines and holes

G Rule, 300mm rule, scriber, tri square and centre punch

H Use goggles and a guard

(8 marks)

2 (b) The manufacturer needs to make a large quantity of microwave oven casings.

Suggest an automated process for producing the holes shown in **Figure 1** on page 2.

.....

.....

(2 marks)

10

3 **Figure 2** shows a die cast aluminium alloy door handle. The handle will have a hard-wearing finish.

Figure 2

3 (a) (i) Suggest a suitable process, to give the handle in **Figure 2** a hard-wearing finish. Do not include painting.

Process .....

(2 marks)

3 (a) (ii) Describe the process.

.....

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.....

(3 marks)

3 (b) One health and safety hazard associated with metal finishing processes is the production of fumes.

How can the risk of fumes be reduced?

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.....

(2 marks)

3 (c) Give **two** reasons why an aluminium alloy is used for the door handle.

1 .....

.....

2 .....

.....

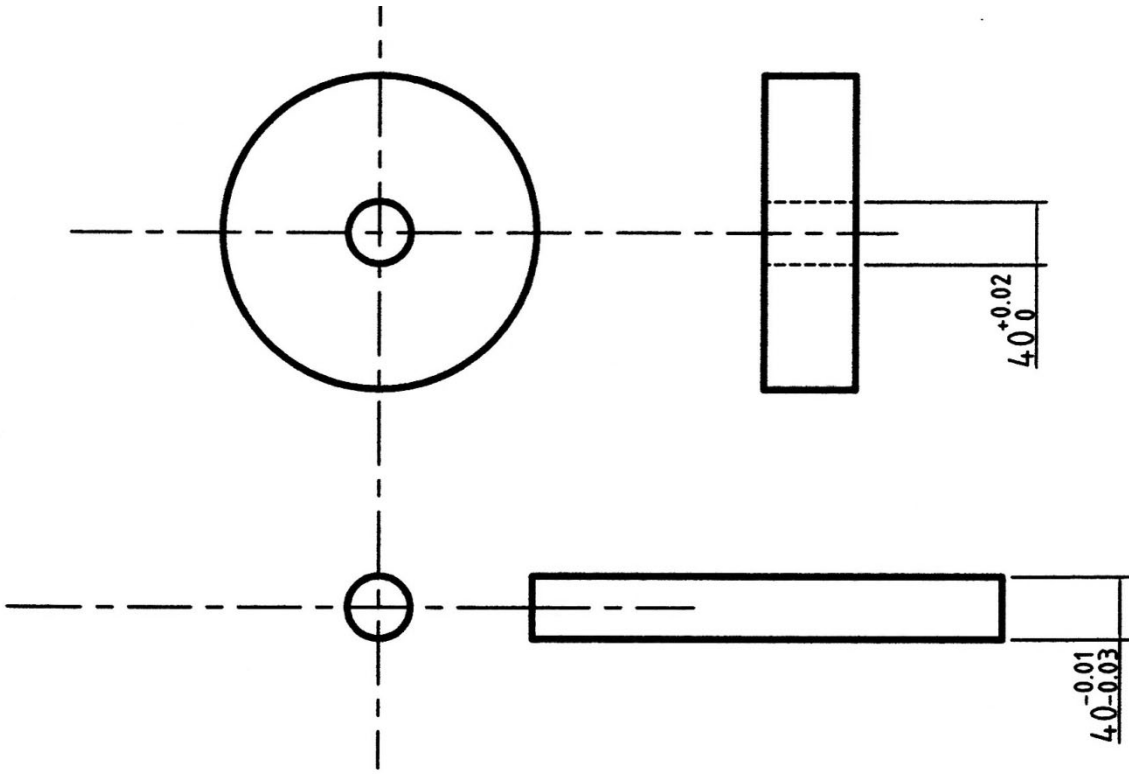
(2 marks)

9

Turn over for the next question

4 **Figure 3** shows a detail drawing for a wheel and axle assembly. The wheel **must** rotate on the axle.
From the information on the drawing, calculate the maximum and minimum diameters of the hole and the axle.

Figure 3



4 (a) (i) maximum size of hole .....
(1 mark)

4 (a) (ii) minimum size of hole .....
(1 mark)

4 (a) (iii) maximum size of axle .....
(1 mark)

4 (a) (iv) minimum size of axle .....
(1 mark)

4 (b) (i) Explain why the tolerances have been allocated to both the hole and the axle.

.....

.....

.....

.....

(2 marks)

4 (b) (ii) What types of gauges would be used to check the hole and axle?

Gauge for hole .....

Gauge for axle .....

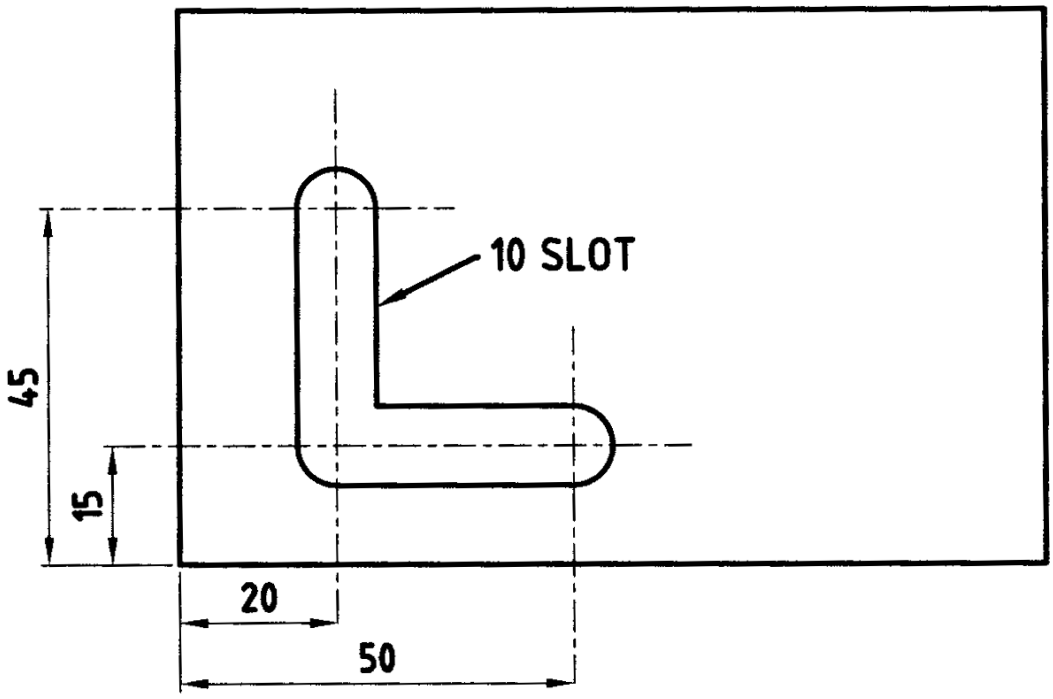
(2 marks)

8

Turn over for the next question

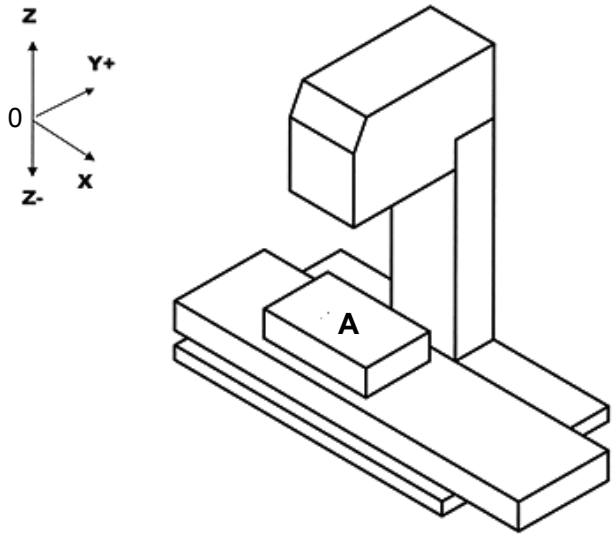
5 **Figure 4** shows an "L" shaped slot in a component. The slot will be milled on a CNC milling machine, using a Ø10 slot drill, to a depth of 5 mm.
The datum or origin (0,0,0) is at the lower left hand corner of the component.

Figure 4



The diagram below represents the arrangement of a CNC milling machine and its three axes.

Figure 5



The block of material for machining is shown as **A** in **Figure 5** above.

5 (a) Complete the table below to show the co-ordinates for the cutter to start and finish the machining of the slot in **Figure 4** on page 10.

Operation	X co-ordinate	Y co-ordinate	Z co-ordinate
Move to start of slot		45	10
Start to mill slot	20		-5
Continue to mill slot	20	15	-5
Change of direction			
Exit slot	50	15	10
Return to datum		0	0

(6 marks)

5 (b) Explain how the component in **Figure 4** on page 10 could be manufactured using a CAD/CAM system.

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(3 marks)

9

Turn over for the next question

6 (a) Give **three** examples of the use of robotic systems in the manufacture of household appliances, such as washing machines, refrigerators, and so on.

1 .....

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2 .....

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3 .....

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.....

(6 marks)

6 (b) Robot arms and robotic systems are used in the automobile industry to assemble cars. Give **one** health and safety issue affecting humans associated with the use of robotic systems.

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(2 marks)

8

7 (a) Industrial Controllers control situations by monitoring inputs and responding with an output.
Explain **two** of the inputs and outputs in controlling an air conditioning plant in a factory.

Two inputs .....

.....

.....

.....

Two outputs .....

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(4 marks)

7 (b) Explain how a *Smart Material* can indicate a change in temperature.

.....

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.....

(2 marks)

6

Turn over for the next question

8 This question is about the production and use of energy.
Quality of Written Communication will be assessed in this question.

Discuss different ways in which manufacturers can reduce their costs and/or consumption of energy.

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(8 marks)

8

END OF QUESTIONS

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