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	

General Certificate of Secondary Education
June 2012

Engineering 48503

Unit 3 Application of Technology

Friday 18 May 2012 9.00 am to 10.00 am

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.

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 Questions 5(a) and 5(c).

There are no questions printed on this page

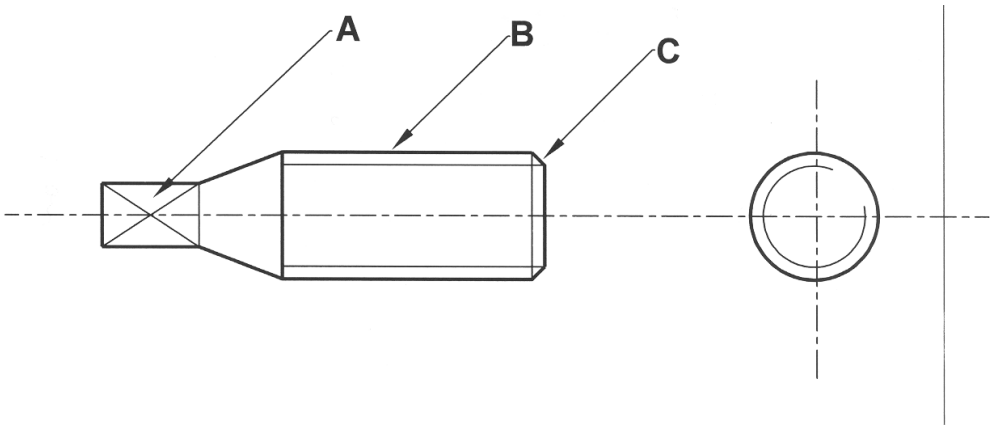
DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

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

Question 1

Engineering drawings use many different ways of representing information about components.

Figure 1



1 (a) Name the features shown in **Figure 1** above.

A .....

B .....

C .....

(3 marks)

1 (b) What do **each** of the following symbols and abbreviations mean?

MATL .....

NTS .....

M/C .....

Ø .....

(4 marks)

1 (c) Give **two** examples of where an exploded view of an object may be used.

1 .....

.....

2 .....

.....

(2 marks)

9

Turn over ▶

Question 2

A bracket for supporting a small electric motor has been designed to use the minimum amount of material. This is shown in **Figure 2** and its development in **Figure 3**.

Figure 2

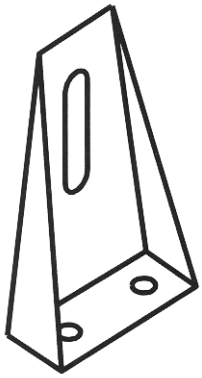
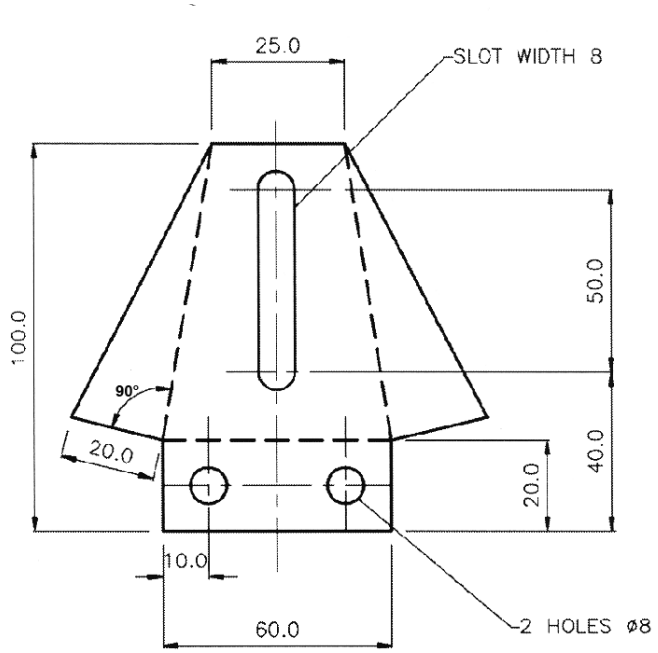


Figure 3



MATL. : 0.8 THICK LOW CARBON STEEL
SCALE : NTS , DASHED LINES: BEND LINES
ALL DIMENSIONS IN MM

2 Use the shapes below to construct a flow chart showing the sequence of manufacturing a single prototype bracket. Use the space opposite for your flow chart.

Chemically clean and galvanise	Mark out and cut outline	Bend to shape
Weld	Inspect	Mill slot
	Drill holes	Scrap

(10 marks)

10

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Question 3

3 (a) Welding can be hazardous.
State **two** personal safety precautions to be taken when welding.

1 .....

.....

2 .....

.....

(4 marks)

3 (b) The bracket shown in **Figure 2** on page 4 is to be used in a washing machine.
Galvanised low carbon steel has been chosen as the preferred material.
Suggest a suitable alternative ferrous metal that could be used, and explain why you think low carbon steel has been chosen.

Alternative ferrous metal .....

Low carbon steel has been chosen because .....

.....

.....

.....

.....

.....

(4 marks)

3 (c) The hole positions on the bracket are critical.
Explain how these could be checked quickly and accurately on a production line.

.....

.....

.....

.....

(2 marks)

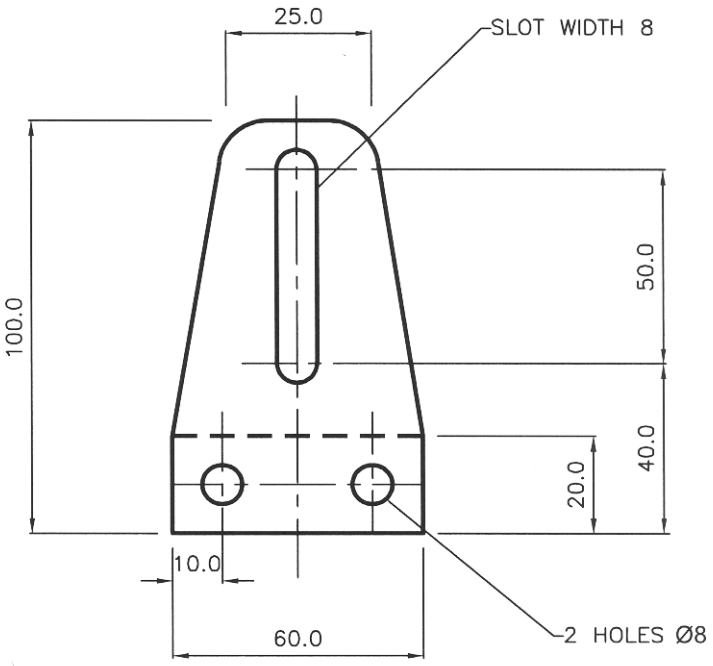
10

Question 4

The bracket shown in **Figure 2** on page 4 has been re-designed using thicker material to simplify the production process. The new design development is shown in **Figure 4**.

Figure 4

MATL. : 3.0 THICK LOW CARBON STEEL.
SCALE: NTS, DASHED LINES: BEND LINES
ALL DIMENSIONS IN MM
DATUM (ORIGIN) : LOWER LEFT HAND CORNER



4 (a) A manufacturer needs to make 200 000 of the blanks shown in **Figure 4**. Name a machine that could do this and explain how it would make them.
Note: this would not be a milling machine.

.....

.....

.....

.....

.....

(3 marks)

4 (b) The production process described above would be carried out by one machine over a period of 4 days.
What type of production method is this?

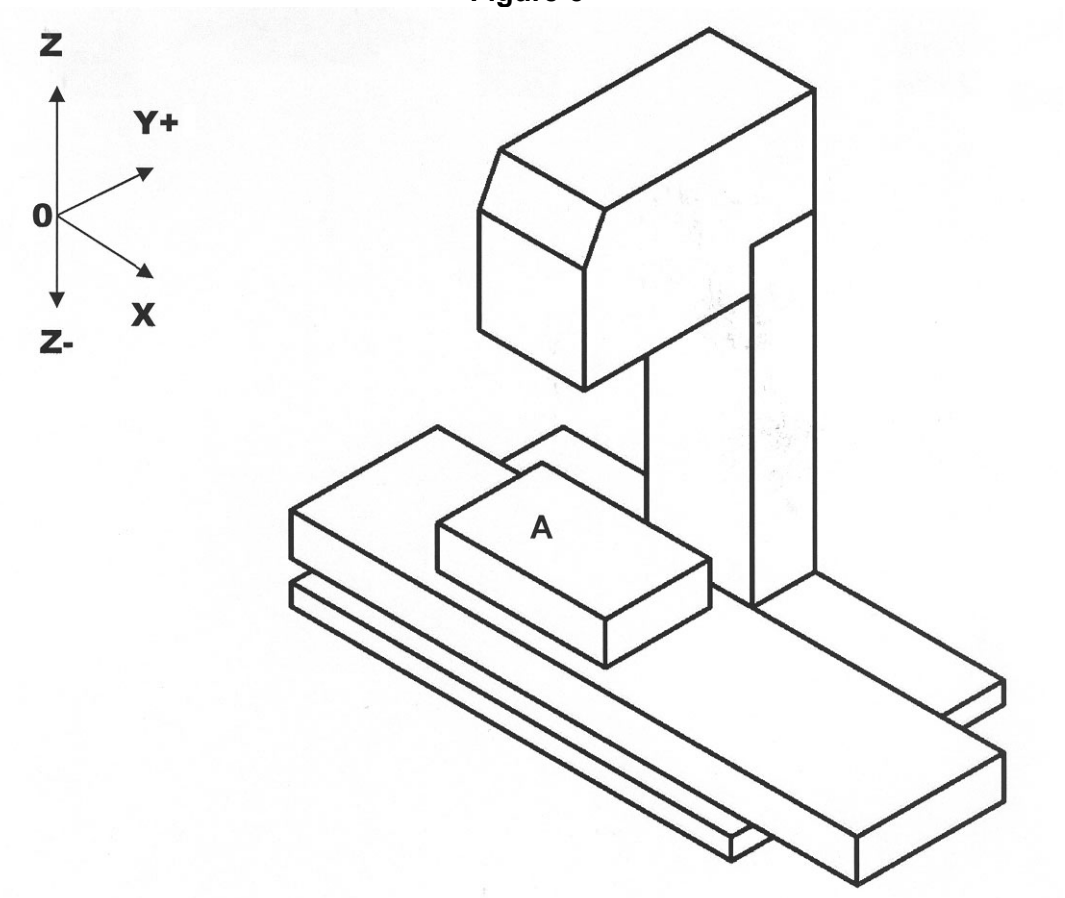
.....

.....

(1 mark)

4 (c) Before the production of the re-designed bracket, a prototype is to be made using a CNC milling machine.
The diagram below represents the arrangement of a CNC milling machine and its three axes.

Figure 5



The block of material to be machined is shown as **A** in **Figure 5**.

Complete the table below to show the co-ordinates to which the cutter needs to go to start and finish the machining of the holes and slot in **Figure 4** on page 8.

Operation	X co-ordinate	Y co-ordinate	Z co-ordinate
Move to start of hole 1	10	10	10
Drill hole 1	10	10	-4
Exit hole 1	10	10	
Move to hole 2	50	10	10
Drill hole 2		10	-4
Exit hole 2	50	10	10
Move to start of slot	30		10
Plunge to depth	30	40	-4
Move to end of slot		90	
Exit slot	30		10
Return to datum	0	0	0

(6 marks)

10

Question 5

5 (a) The re-designed bracket in **Figure 4** uses more than double the material of that in **Figure 2** but the cost of production and the energy used in manufacture was halved. Discuss an environmental issue for **and** against this strategy.

For .....

.....

.....

.....

Against .....

.....

.....

.....

(4 marks)

5 (b) (i) Explain what is meant by a sustainable energy source.

.....

.....

.....

(2 marks)

5 (b) (ii) Give **one** example of a **non-sustainable** energy source.

.....

.....

(1 mark)

5 (c) Explain why the government is encouraging the use of sustainable energy sources.

.....

.....

.....

.....

.....

.....

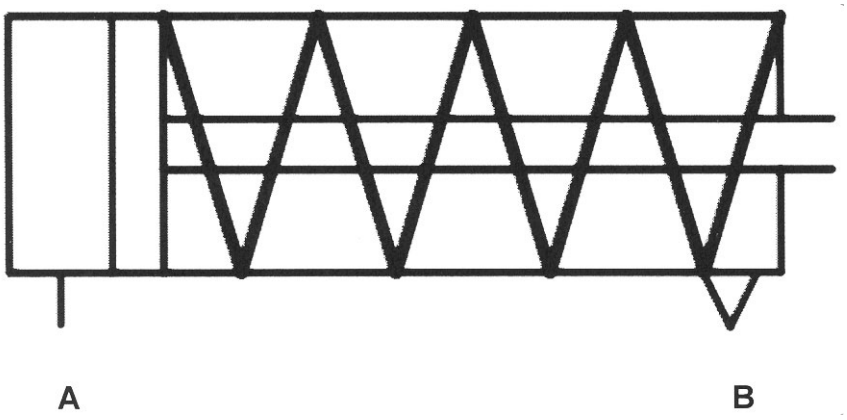
(4 marks)

11

Question 6

6 **Figure 6** shows a sketch of a single-acting pneumatic cylinder.

Figure 6



6 (a) Name the **two** moving parts in **Figure 6**.

1 .....

2 .....

(2 marks)

6 (b) Explain how the single-acting cylinder in **Figure 6** works. Refer to ports **A** and **B**.

.....

.....

.....

.....

.....

.....

.....

(4 marks)

6

Turn over ▶

Question 7

7 (a) A micro-controller is an essential part of many domestic appliances.

7 (a) (i) What is a micro-controller?

.....

.....

.....

.....

(2 marks)

7 (a) (ii) Give **one** example of what a micro-controller does in a domestic appliance.

.....

.....

.....

(2 marks)

7 (b) Give **three** examples of where robotic systems are used in the Oil, Gas and Nuclear industries.

1 .....

.....

.....

2 .....

.....

.....

3 .....

.....

.....

(6 marks)

10

Question 8

8 (a) Computer Integrated Manufacture (CIM) is widely used in the car manufacturing industry. Explain what CIM involves.

.....

.....

.....

.....

.....

.....

.....

.....

(4 marks)

8 (b) Racing cars use a wide variety of **composite materials** in their manufacture.

8 (b) (i) What is meant by a composite material?

.....

.....

.....

.....

(2 marks)

8 (b) (ii) Give **one** example of a composite material.

.....

.....

(1 mark)

8 (b) (iii) Give **two** reasons why composite materials are used in racing car manufacture.

.....

.....

.....

.....

(2 marks)

9

END OF QUESTIONS

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED