

**GCSE**  
**DESIGN & TECHNOLOGY**  
**INDUSTRIAL TECHNOLOGY**  
PAPER 4 (Higher Tier)  
**WEDNESDAY 13 JUNE 2007**

**H** **1959/4**

Afternoon

Time: 1 hour 15 minutes

Candidates answer on question paper.  
No additional materials are required.



Candidate  
Name

Centre  
Number

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Candidate  
Number

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**INSTRUCTIONS TO CANDIDATES**

- Write your name, Centre number and Candidate number in the boxes above.
- Answer **all** the questions.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Do **not** write in the bar code.
- Do **not** write outside the box bordering each page.
- **WRITE YOUR ANSWER TO EACH QUESTION IN THE SPACE PROVIDED. ANSWERS WRITTEN ELSEWHERE WILL NOT BE MARKED.**

**INFORMATION FOR CANDIDATES**

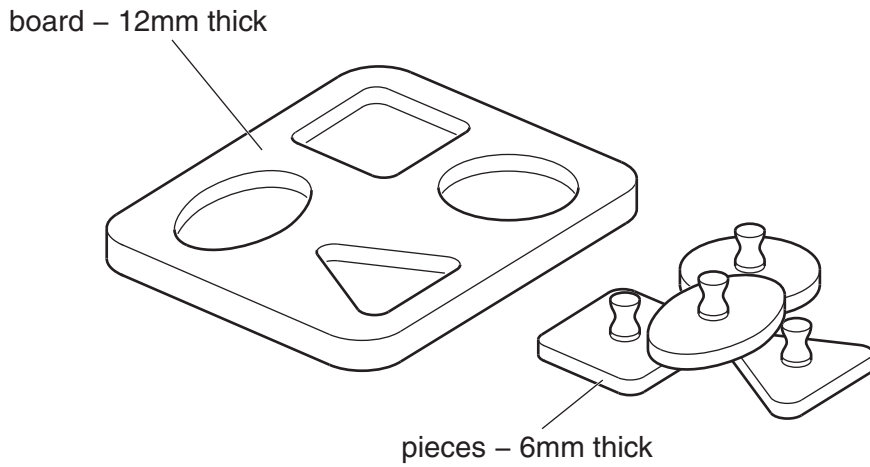
- The number of marks is given in brackets [ ] at the end of each question or part question.
- All dimensions are in millimetres.
- Assume any mechanical system to be 100% efficient.

| For Examiner's Use |  |
|--------------------|--|
| 1                  |  |
| 2                  |  |
| 3                  |  |
| 4                  |  |
| 5                  |  |
| Total              |  |

This document consists of **11** printed pages and **1** blank page.

1 CAD/CAM is widely used by designers and manufacturers.

A toy manufacturer wants to produce the educational toy shown in Fig. 1.



**Fig. 1**

(a) Give **two** benefits of using CAD when designing the educational toy shown in Fig. 1.

Benefit 1 \_\_\_\_\_  
\_\_\_\_\_ [1]

Benefit 2 \_\_\_\_\_  
\_\_\_\_\_ [1]

(b) The company wants to introduce CAM into its manufacturing process.  
State **two** possible effects on the workforce.

Effect 1 \_\_\_\_\_  
\_\_\_\_\_ [1]

Effect 2 \_\_\_\_\_  
\_\_\_\_\_ [1]

(c) (i) Name a type of CNC machine that would be suitable for making a prototype of the toy shown in Fig. 1.

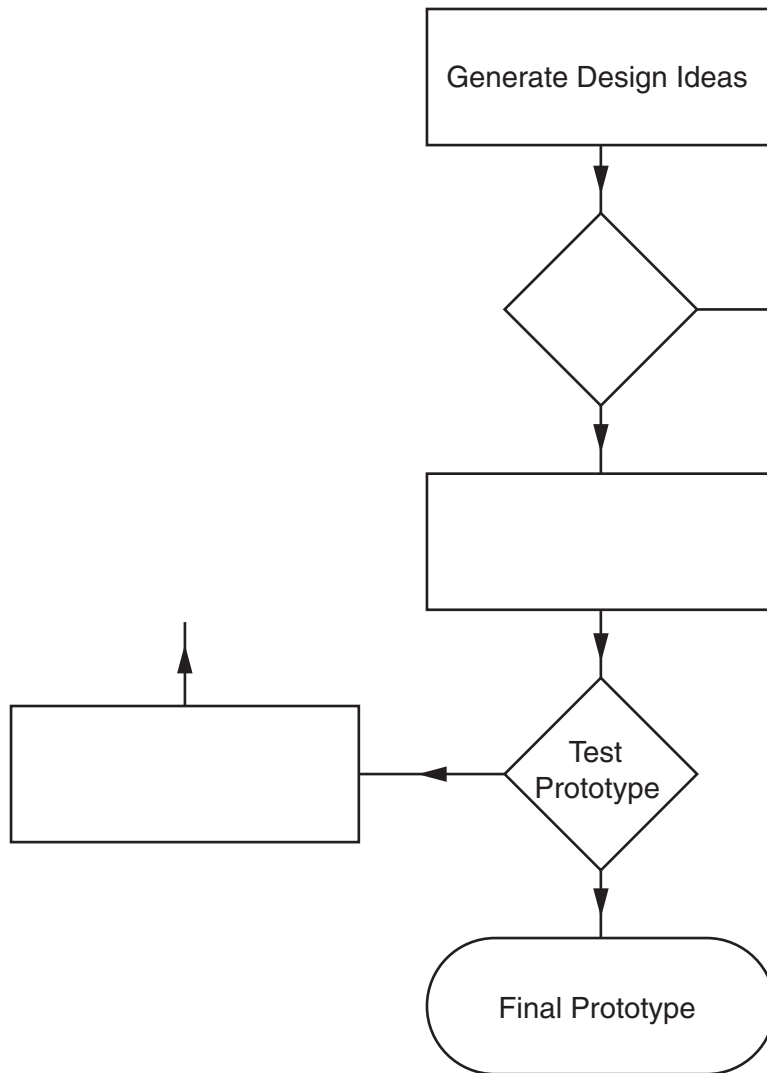
\_\_\_\_\_ [1]

(ii) State what the letters CNC stand for.

C \_\_\_\_\_ N \_\_\_\_\_ C \_\_\_\_\_ [1]

(d) Flow charts are often used for planning.

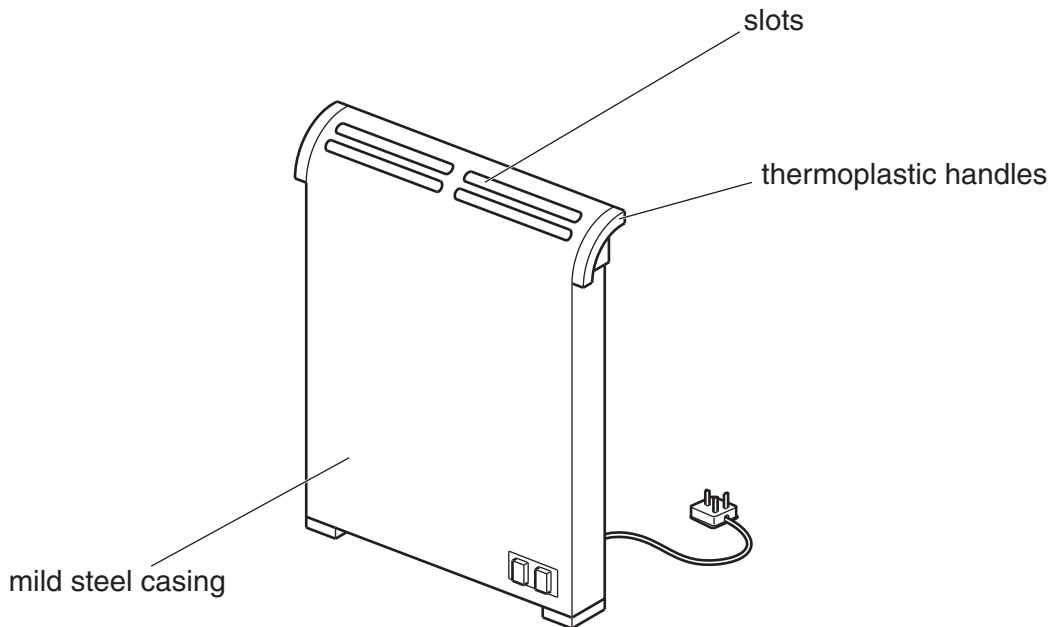
Complete the flow chart below to show the stages needed when using CAD/CAM to design and make a prototype of a new product.



[4]

[Total: 10]

- 2 Fig. 2 shows a slimline electric heater. The heater has been designed to be free-standing or wall mounted.



**Fig. 2**

- (a) Name **one** industrial process that could be used to produce batches of the mild steel casing.

\_\_\_\_\_ [1]

- (b) The thermoplastic handles are produced by injection moulding.

- (i) Name a thermoplastic that would be suitable to use for making the handles.

\_\_\_\_\_ [1]

- (ii) Give **two** reasons why injection moulding is a suitable process for the manufacture of these handles.

Reason 1 \_\_\_\_\_

\_\_\_\_\_ [1]

Reason 2 \_\_\_\_\_

\_\_\_\_\_ [1]

(c) The heater shown in Fig. 2 is found to be unstable when free-standing.

Use sketches and notes to show **one** possible design modification that would make it more stable.

[2]

(d) A fitting is needed to enable the heater to be wall mounted.

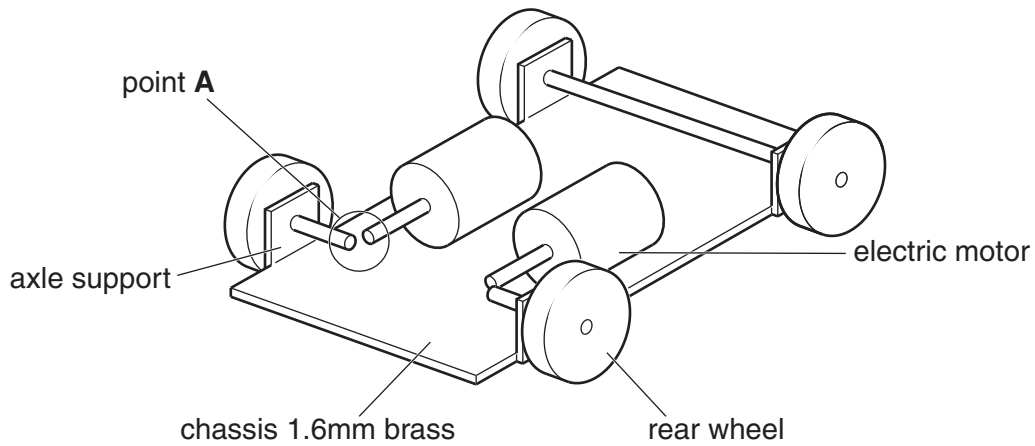
Design a suitable fitting that:

- supports the heater securely;
- allows easy removal; and
- spaces the heater from the wall.

[4]

[Total: 10]

- 3 A prototype for a radio-controlled buggy is shown in Fig. 3.  
The chassis holds two small electric motors that drive the rear wheels of the buggy.



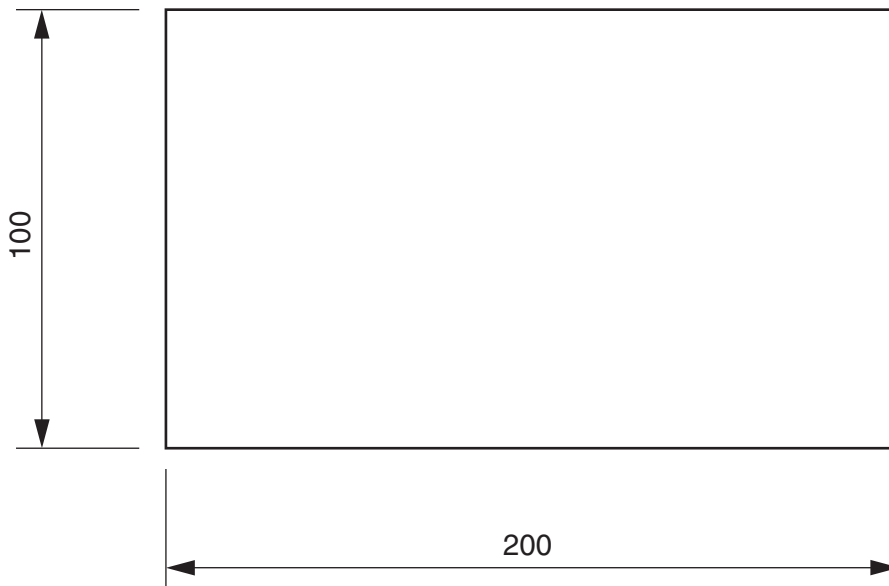
**Fig. 3**

- (a) Name a suitable gear system to use at point **A** for driving the wheel axle.

\_\_\_\_\_ [1]

- (b) The chassis is to be cut from a sheet of brass  $200 \times 100 \times 1.6$  thick.

- (i) Draw the net (development) of the chassis on the blank shown below.



[2]

(ii) Name **two** hand tools that could be used to cut out the shape of the chassis.

Tool 1 \_\_\_\_\_[1]

Tool 2 \_\_\_\_\_[1]

(iii) Name the workshop process that would be used to soften the brass before bending up the axle supports as shown in Fig. 3.

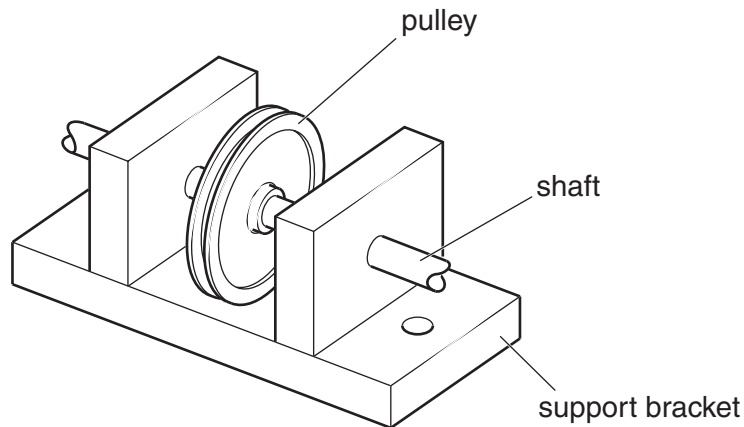
\_\_\_\_\_ [1]

(c) Using sketches and notes, show a design modification to the chassis that would give better support to the axles when the wheels are being driven by the electric motors.

[4]

[Total: 10]

- 4 Fig. 4 shows a support bracket for a vee-belt pulley. The bracket has been fabricated from 20 mm thick mild steel.



**Fig. 4**

- (a) Explain what is meant by the term “fabricated”.

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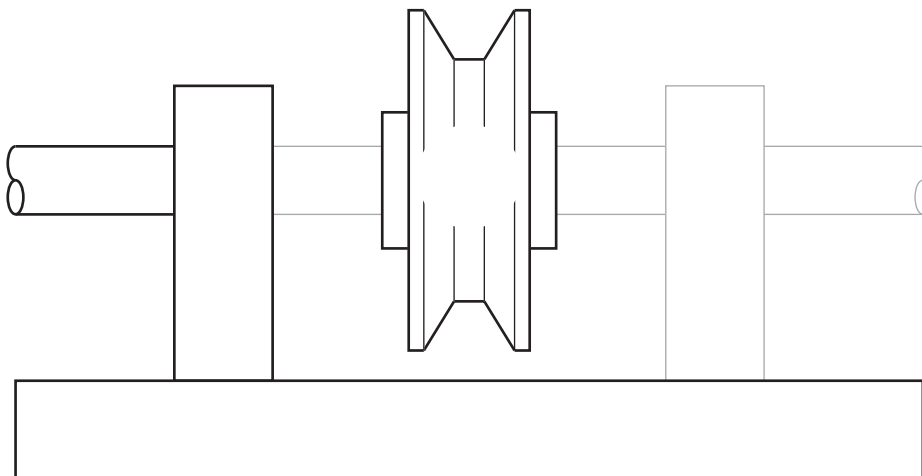
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[2]

- (b) The shaft carrying the pulley needs to be able to turn, but should not be able to slide through the bracket when the pulley is in use.

On the diagram below, use sketches and notes to show a method of holding the shaft in the bracket so that :

- the shaft can turn freely;
- it is possible to remove the shaft easily when necessary; and
- the shaft cannot slide through the bracket when the pulley is in use.



[4]



- (c) In order to save weight it has been decided to produce the bracket from a block of aluminium alloy.

Give the name of a workshop machine that could be used to produce the shape of the bracket shown in Fig 4.

\_\_\_\_\_ [1]

- (d) Batches of aluminium alloy brackets could be produced by die casting.

Give **three** benefits to the manufacturer of using the die casting process.

Benefit 1 \_\_\_\_\_  
\_\_\_\_\_ [1]

Benefit 2 \_\_\_\_\_  
\_\_\_\_\_ [1]

Benefit 3 \_\_\_\_\_  
\_\_\_\_\_ [1]

[Total: 10]

5 A large manufacturing firm has decided to operate the “Just In Time” system in its new assembly plant.

(a) (i) Describe **two** benefits, to the manufacturer, of the “Just In Time” system.

Benefit 1 \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [2]

Benefit 2 \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [2]

(ii) Describe **one** disadvantage of the “Just in Time” system.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [2]

(b) In addition to their use in CAD/CAM systems, computers are also used by manufacturers for other purposes.

Describe **two** ways in which computer technology is used in the manufacturing industry, other than in CAD/CAM systems.

1 \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [2]

2 \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [2]

[Total: 10]

11  
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