



General Certificate of Secondary Education
2012

Centre Number

71

Candidate Number

Technology and Design

Unit 1: Technology and Design Core

[GTD11]

FRIDAY 25 MAY, MORNING



TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

Write your answers in the spaces provided in this question paper.

Answer **all eleven** questions.

On **page 3** we have provided formulae for you to use with this paper.

INFORMATION FOR CANDIDATES

The total mark for this paper is 90.

Quality of written communication will be assessed in question **11**.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

For Examiner's
use only

Question Number	Marks
1	
2	
3	
4	
5	
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7	
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10	
11	

Total
Marks

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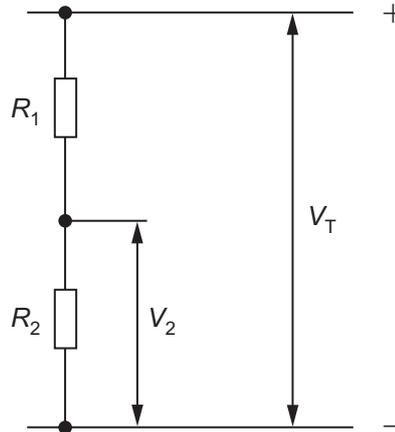
Formulae for GCSE Technology and Design

You should use, where appropriate, the formulae given below when answering questions which include calculations.

1 Potential Difference = current \times resistance ($V = I \times R$)

2 For potential divider

$$V_2 = \frac{R_2}{R_1 + R_2} \times V_T$$



3 Series Resistors $R_T = R_1 + R_2 + R_3 \text{ etc}$

4 Gear ratio of a simple gear train = $\frac{\text{number of teeth on driven gear}}{\text{number of teeth on driver gear}}$

- 2 **Fig. 1** shows a CNC milling machine with a piece of wood ready to be cut into shape. The cutting tool moves in various directions to cut out the required shape.



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Fig. 1

- (a) Outline **one** method of holding the wood in the CNC machine.

[1]

- (b) The three main cutting axes of the CNC milling machine are shown in **Fig. 2**. They are the X-axis, the Y-axis and the Z-axis. Complete the diagram by correctly labelling each axis shown. [3]

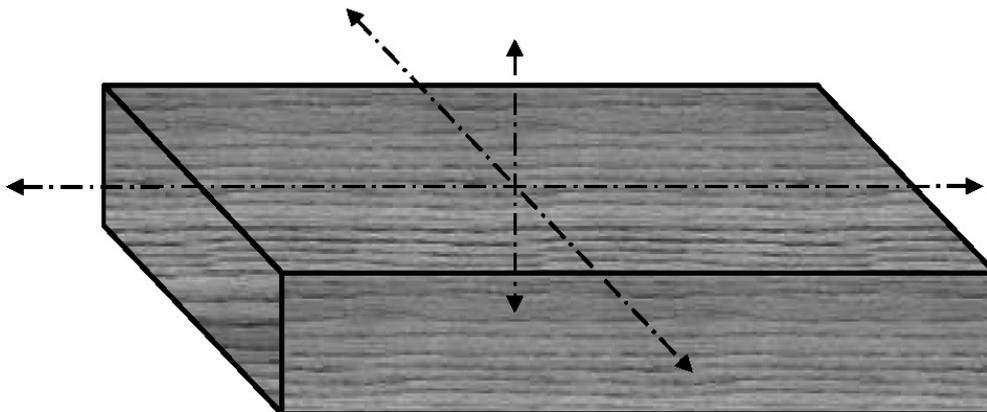


Fig. 2

- (c) How is a design generated for the process of computer aided manufacture (CAM)?

[1]

Examiner Only	
Marks	Remark

- 3 Fig. 3 shows a gear train used in a toy crane. The loads **D** and **E** are raised and lowered by cords wound on pulleys attached to the gears **A** and **C**. The gear **B** can be rotated by a handle as shown.

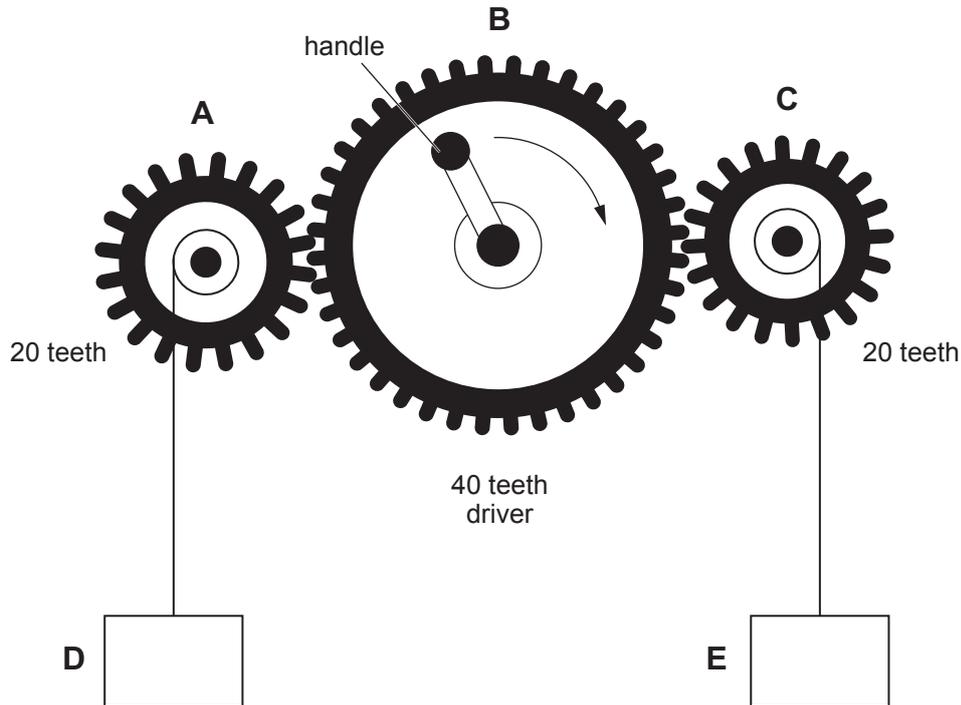


Fig. 3

- (i) The handle on **B** is rotated clockwise as shown.

Mark on **Fig. 3**:

- The direction of rotation of gears **A** and **C**.
- The direction of movement of loads **D** and **E**.

[4]

- (ii) Wheel **B** is rotated at 30 rev/min.
Determine the speed of wheels **A** and **C**.

_____ [2]

Examiner Only	
Marks	Remark

4 Fig. 4 shows a cordless power drill.



Fig. 4

- (i) Give **one** advantage and **one** disadvantage of a battery powered drill compared to one powered from the mains.

Advantage _____

Disadvantage _____ [2]

- (ii) Suggest an application for each of the following features of the drill.

Slow speed start _____

_____ [1]

Reverse rotation _____

_____ [1]

- (iii) Outline **two other** features a designer could consider in the design of a cordless power drill.

1. _____

2. _____

_____ [2]

Examiner Only	
Marks	Remark

5 The electronic component represented in **Fig. 5** is used in the circuit shown in **Fig. 6**.

(a) Name the component and identify each of the three connecting points labelled X, Y and Z.



Fig. 5

Name of Component _____ [1]

Point X is called the _____ [1]

Point Y is called the _____ [1]

Point Z is called the _____ [1]

(b) Describe the operation of the above component when used in the circuit shown in **Fig. 6**.

Operation _____

 _____ [5]

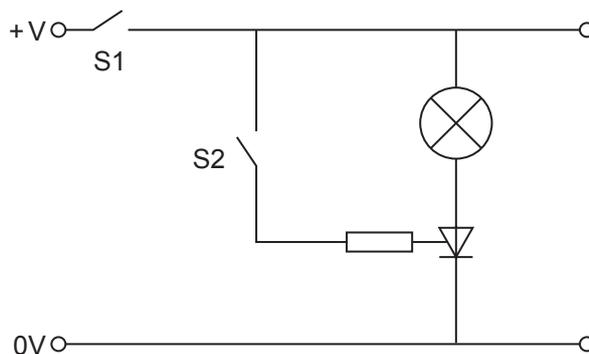


Fig. 6

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6 Fig. 7 shows a circuit for clamping wood before drilling.

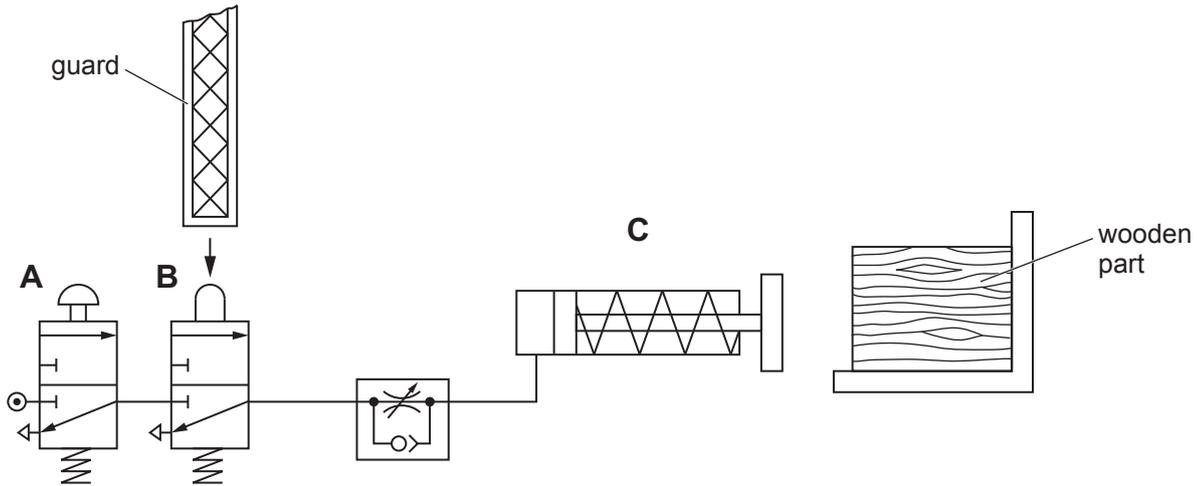


Fig. 7

- (i) Three pneumatic components in Fig. 7 are lettered. Complete Table 2 by inserting the correct letter A, B or C to represent each component listed.

Table 2

Pneumatic Component	Letter
3/2 Valve Plunger Operated	
Single Acting Cylinder	
3/2 Valve Button Operated	

[3]

- (ii) Explain how component C is operated to clamp the wood.

_____ [2]

- (iii) During clamping it was found that the wood was being damaged. Explain how this problem could be overcome.

_____ [2]

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Marks	Remark

- 7 **Fig. 8** shows a CAD drawing of a menu holder for a cafe. The holder is to be made from 1.5 mm acrylic sheet.

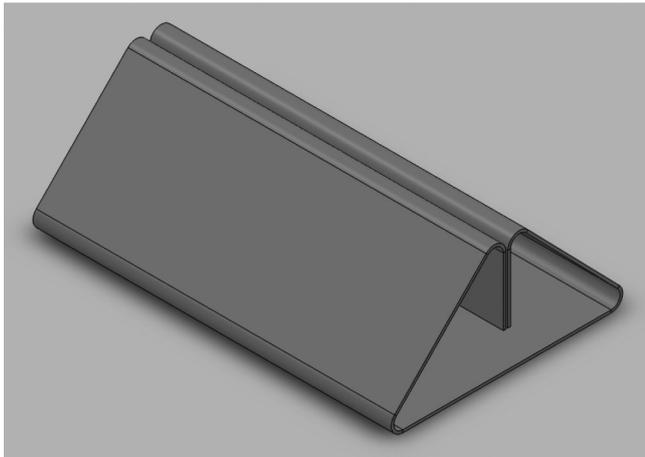


Fig. 8

- (a) (i) Which one of the two categories, thermosetting or thermoplastic, does acrylic belong to?

_____ [1]

- (ii) Name another plastic, in the same category as acrylic, that is used in the school workshop.

_____ [2]

- (b) (i) Outline **two** important features of the jig used to produce the holder.

 _____ [2]

- (ii) Suggest a suitable material for the jig and give a reason for your choice.

Material:

_____ [1]

Reason:

_____ [1]

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Marks	Remark

- 8 (a) Fig. 9 shows an electronic circuit for a school project. Name and identify the **Input**, **Process** and **Output** component symbols shown in Fig. 9 by completing Table 3.

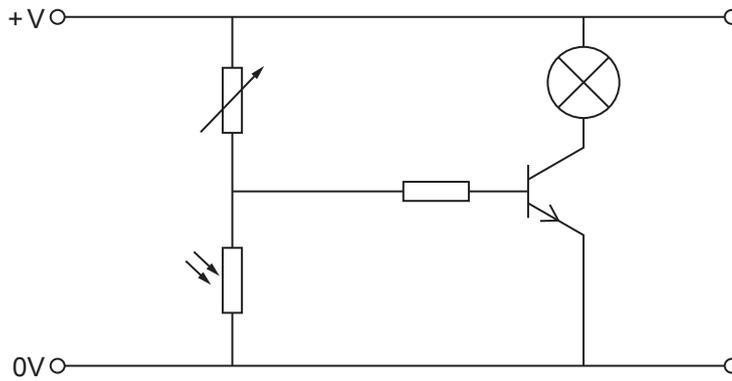


Fig. 9

Table 3

INPUT	PROCESS	OUTPUT

[5]

- (b) Explain the operation of the circuit shown in Fig. 9 ensuring that the purpose of each component in the circuit is considered.

[6]

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Complete the flow chart in **Fig. 11** to operate as follows:

LEDs 2, 4 and 6 to turn on and remain on for 10 seconds. LEDs 1, 3, 5 and 7 should turn on 3 seconds after LEDs 2, 4 and 6 turn on, and remain on for 7 seconds. All LEDs should then turn off and remain off for 4 seconds. The system is to run continuously unless a switch is pressed to stop the operation.

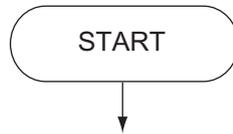


Fig. 11

[10]

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- 10 A basketball net used in a school gym is to be fitted to a wooden backboard as shown in Fig. 12.

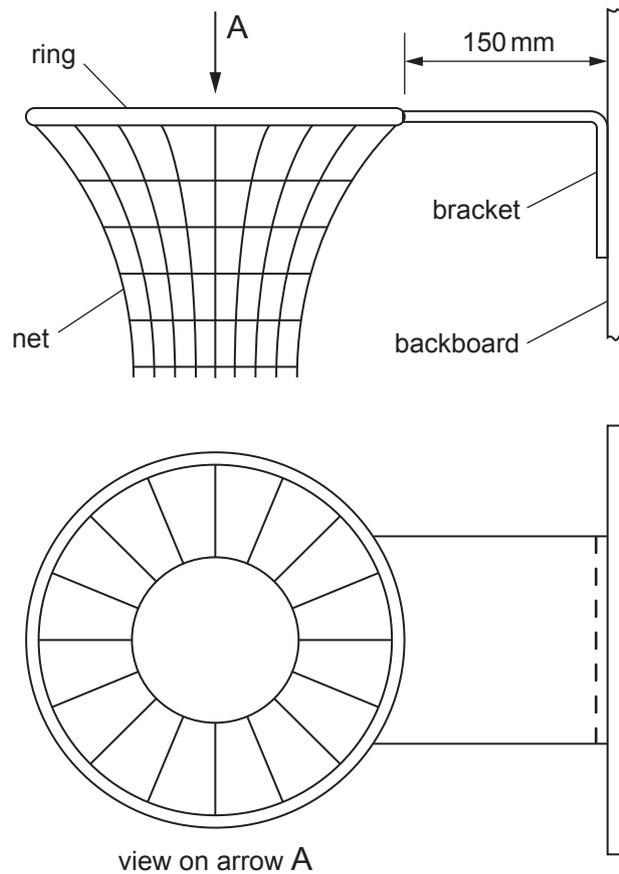


Fig. 12

- (a) Suggest a suitable material for the ring and bracket.
Give a reason for your choice.

Material _____ [1]

Reason _____ [1]

- (b) State a method of joining the different parts shown in Fig. 12. Indicate whether the method is permanent or semi-permanent.

- (i) Joining the ring to the bracket.

Method _____ [1]

Type _____ [1]

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(ii) Joining the bracket to the backboard.

Method _____ [1]

Type _____ [1]

(c) When in use it was found that the design as shown in **Fig. 12** needed to be strengthened.
Explain how this could be achieved.

_____ [2]

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