Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2013

Technology and Design

Unit 1: Technology and Design Core

[GTD11]

GTD11

WEDNESDAY 15 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.
Complete in blue or black ink only. **Do not write in pencil or with a gel pen.**
Answer **all eleven** questions.

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.

24GTD1101

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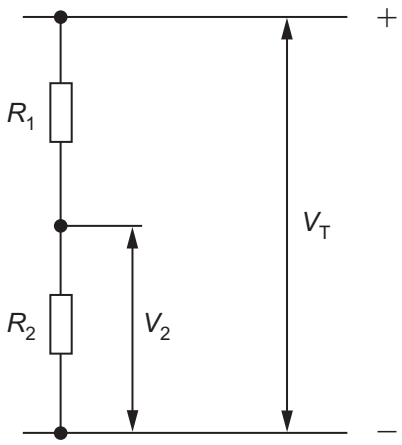
Formulae for GCSE Technology and Design

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

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

2 For potential divider

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



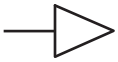
3 Series Resistors $R_T = R_1 + R_2 + R_3$ *etc*

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

[Turn over

1 **Table 1** shows a number of different symbols. Using the first row as a guide, complete the table.

Table 1

Sketch of Symbol	Type of Symbol	Name of Symbol
	Electronic	Bulb
	Electronic	Voltmeter
	Mechanical	
		
		Use face shield
		Potentiometer
		

[9]

Examiner Only	
Marks	Remark
Total Question 1	

2 Computer control systems are used to perform a range of functions.

The list below shows input and output devices that could be connected to a computer.

Select and write down **three** input devices and **three** output devices from the given list.

LIST:

Printer
Pressure Pad
Toggle Switch
CNC Machine
Keyboard
Electric Motor

input device 1 _____

input device 2 _____

input device 3 _____ [3]

output device 1 _____

output device 2 _____

output device 3 _____ [3]

Examiner Only	
Marks	Remark
Total Question 2	

[Turn over

Examiner Only	
Marks	Remark

3 **(a)** Complete **Table 2** by inserting the correct type of motion from the list below.

Table 2

Motion	Type of motion
An Electric motor	
Car windscreen wipers	
Using a hacksaw	
Pressing a push to make switch	

LIST:
A Linear
B Rotary
C Reciprocating
D Oscillating [4]

(b) **Fig. 1** shows a lever which is used to operate a foot brake.

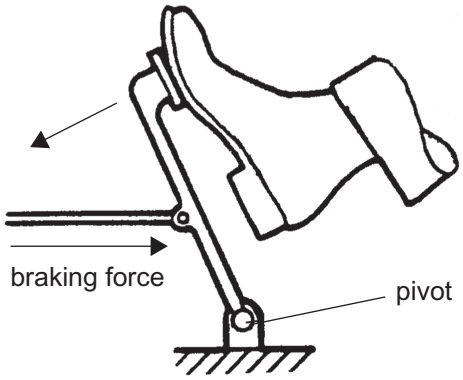


Fig. 1

(i) State the class of lever shown.

_____ [1]

(ii) Suggest how the design in **Fig. 1** could be modified to give a greater braking force.

_____

_____ [2]

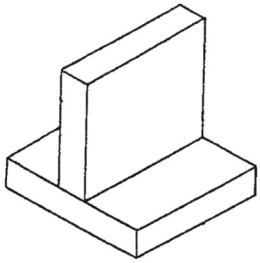
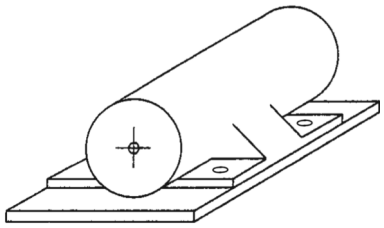
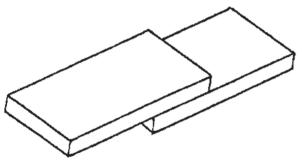
Total Question 3

4 **Table 3** shows three examples of parts to be joined.

(i) Complete **Table 3** by inserting an appropriate method for joining in each case.

(ii) Indicate in the appropriate column if the method is permanent or semi-permanent.

Table 3

Example	Method	Permanent or Semi-permanent
 Steel plates		
 Electric Motor to a Steel Plate		
 Acrylic strips		

[6]

Examiner Only	
Marks	Remark
Total Question 4	

[Turn over

Examiner Only	
Marks	Remark

5 **Table 4** lists four electronic components and the type of input required to operate each component.

(a) Complete **Table 4** by stating the expected output from each component.

Table 4

Name of Electronic Component	Input	Output
LED	Electrical	
Motor	Electrical	
Buzzer	Electrical	
Thyristor	Electrical	

[4]

(b) The buzzer and thyristor listed in **Table 4** are to be used to complete the circuit shown in **Fig. 2**.

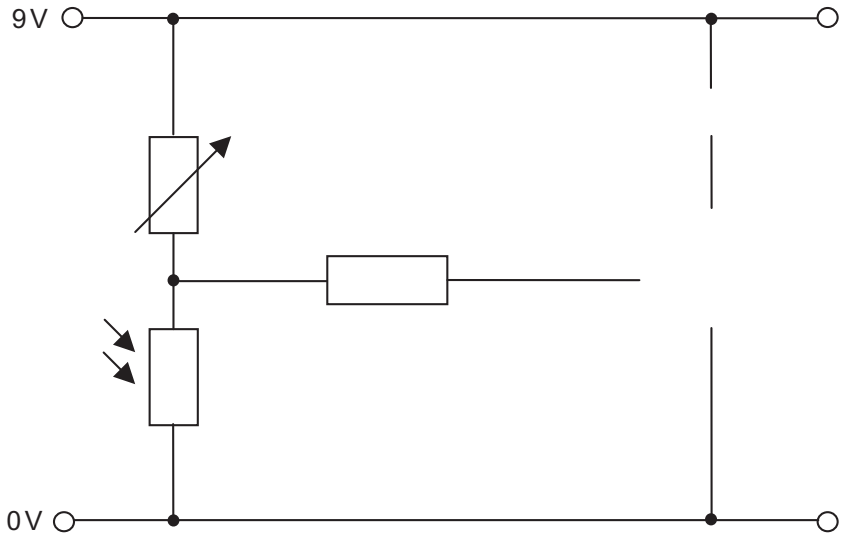


Fig. 2

(i) Complete **Fig. 2** by correctly inserting the buzzer and thyristor. [4]

(ii) State **two** important functions of the thyristor in this circuit.

1. _____

_____ [1]

2. _____

_____ [1]

(iii) Is the buzzer activated in daytime or night-time?

_____ [1]

Examiner Only	
Marks	Remark
Total Question 5	

Examiner Only	
Marks	Remark

6 **Fig. 3** shows a pneumatic circuit which is used to clamp parts on a machine table. The clamps are to be applied at the same time.

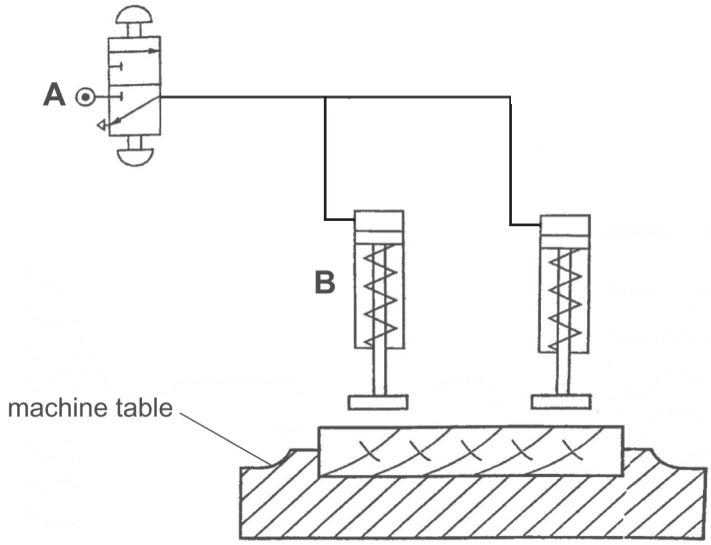


Fig. 3

(a) **(i)** Name the components **A** and **B**.

A _____

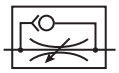
B _____ [2]

(ii) Explain how the circuit operates.

_____

_____ [2]

(b) Valve **C** shown below is to be fitted in the circuit.

C 

(i) State the function of valve **C**.

_____ [1]

(ii) Insert an **X** in **Fig. 3** to show the correct position for valve **C**.

Give a reason for your answer.

_____

_____ [2]

Examiner Only	
Marks	Remark
Total Question 6	

Examiner Only	
Marks	Remark

7 **Fig. 4** shows a design of a wooden test tube holder for use in a school science room. The holder is made from three separate parts; top, stem and base.

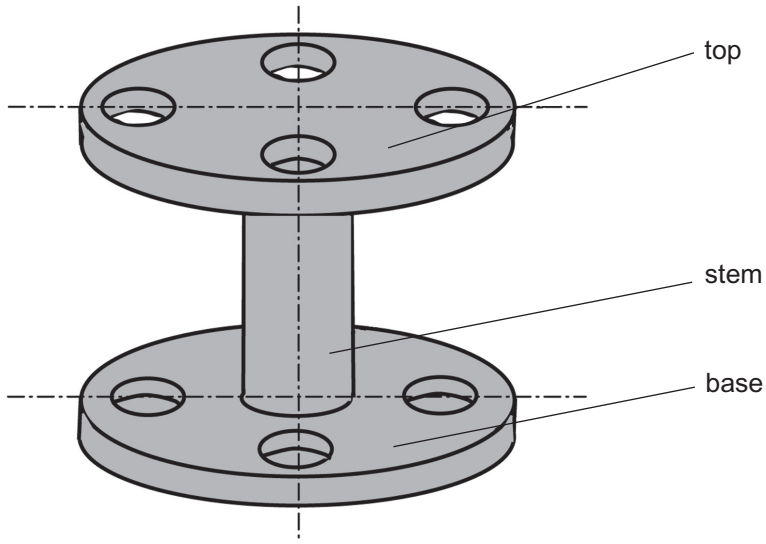


Fig. 4

(a) The designer decided to select beech as the material for the holder.

Suggest a reason for the selection of beech for the holder.

_____

_____ [1]

(b) Name **two** suitable workshop machines that could be used to produce the top of the holder.

1. _____ [1]

2. _____ [1]

(c) Use an annotated sketch or sketches to show how the top, base and stem are to be fitted together. Screws or nails should not be used.

[3]

Examiner Only	
Marks	Remark
Total Question 7	

Examiner Only	
Marks	Remark

8 Electronic circuits make use of conductors and insulators.

(a) State the chief function of a conductor and an insulator in an electronic circuit.

Conductor _____

_____ [1]

Insulator _____

_____ [1]

(b) **Fig. 5** shows a resistor.

Fig. 5

(i) Show the conductor and the insulator by clearly labelling the resistor in **Fig. 5**. [2]

(ii) If the resistor shown in **Fig. 5** has a value of 1.2 kΩ use the information below to work out the colour code for the first three bands shown on the resistor. Band 1 is on the left hand side of **Fig. 5**.

0 = Black	1 = Brown	2 = Red	3 = Orange	4 = Yellow
5 = Green	6 = Blue	7 = Violet	8 = Grey	9 = White

Band 1 _____ [1]

Band 2 _____ [1]

Band 3 _____ [1]

(c) (i) Name the type of circuit shown in **Fig. 6**.

_____ [1]

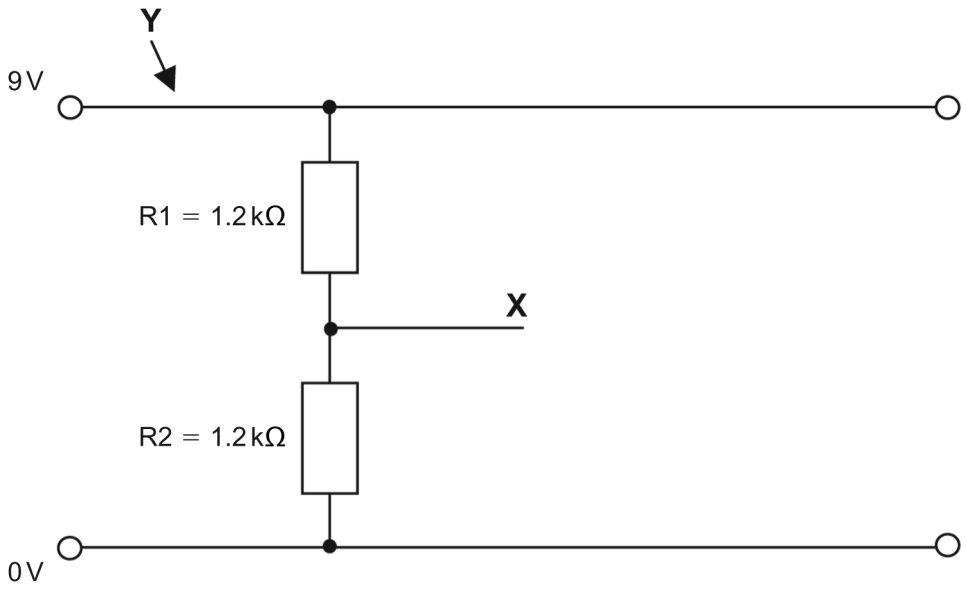


Fig. 6

(ii) State the expected voltage output at **X** if each resistor in **Fig. 6** has a value of 1.2 kΩ.

_____ [1]

(iii) A SPST switch is to be added at point **Y** in **Fig. 6**.

Use the space below to produce a sketch of the symbol for a SPST switch.

[1]

(iv) What does the abbreviation SPST stand for?

_____ [1]

Examiner Only	
Marks	Remark
Total Question 8	

[Turn over

Examiner Only	
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9 Part of a flowchart for an alarm system to enable occupants to exit a building is described below. **Fig. 7** shows a computer control keypad which is activated when a code is entered into the pad.

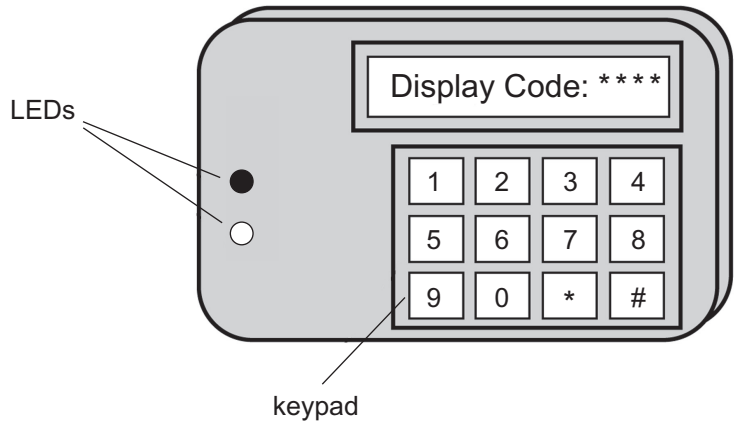
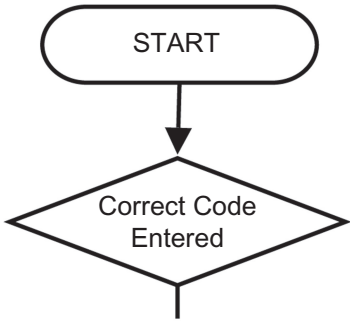


Fig. 7

When the code is entered into the keypad two LEDs are switched on and a timer is activated for 50 seconds to give the occupants time to exit the building.
At the end of 50 seconds the two LEDs will switch off and the alarm will be set.
If an intruder enters the building after the alarm is set, the alarm will activate. When a reset code is entered the alarm will switch off and the program will stop.
Complete the flowchart opposite for the part of the system as described above.



Examiner Only	
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Total Question 9	

[11]

10 **Fig. 8** shows a stand for parking bicycles.

Examiner Only	
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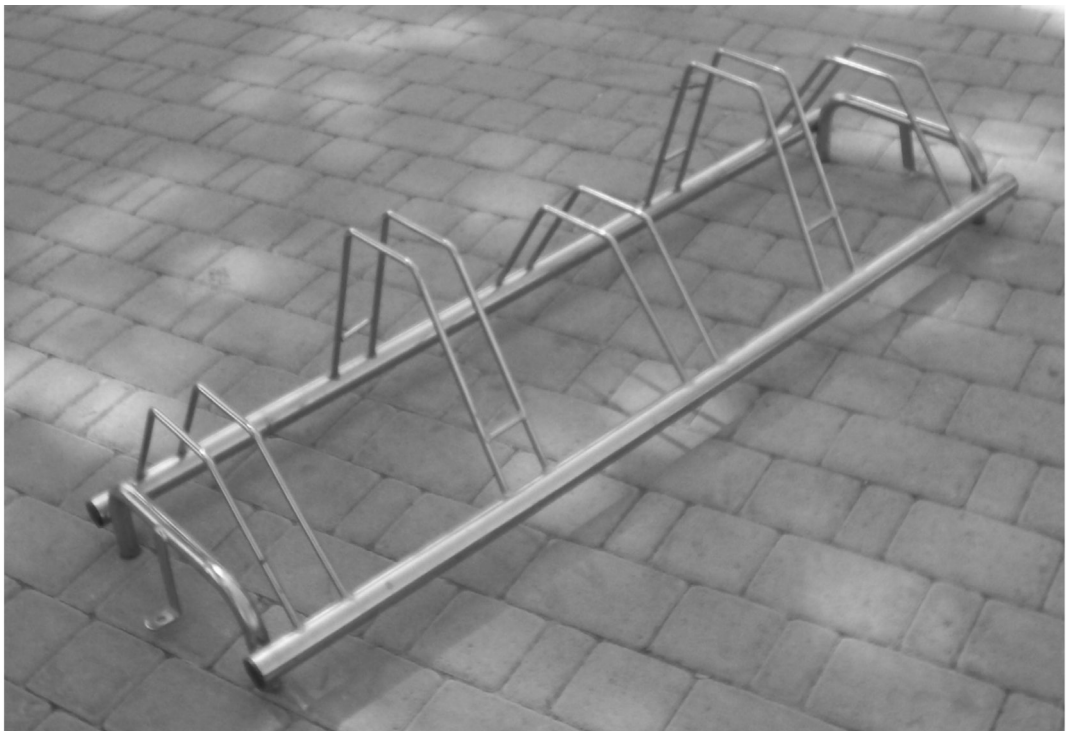

Fig. 8

(a) The stand was manufactured by fabrication. Explain what is meant by fabrication.

_____

_____ [1]

(b) The designer has decided to use stainless steel in preference to mild steel for the stand.

(i) Give **two** reasons for using stainless steel in preference to mild steel.

1. _____

_____

2. _____

_____ [2]

(ii) Give **one** disadvantage of using stainless steel compared to mild steel.

_____

_____ [1]

(c) The stand holds five bicycles. When all five bicycles are parked, two are supported at a different level than the other three.

Suggest why this feature was included in the design.

_____

_____

_____ [2]

Examiner Only	
Marks	Remark
Total Question 10	

11 Vacuum forming is a process used in the school workshop to produce a variety of plastic products.
Describe the process used for preparing and producing a vacuum formed product.
Make reference to any appropriate safety precautions used in this process.

[10]

Examiner Only	
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Total Question 11	

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Question Number	Marks
1	
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