



Rewarding Learning

General Certificate of Secondary Education
2013

Centre Number

--	--	--	--	--

Candidate Number

--	--	--	--

Technology and Design

Unit 2:
Systems and Control

Element 1: Electronic and
Microelectronic Control Systems



[GTD21]

GTD21

FRIDAY 7 JUNE, AFTERNOON

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** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 80.

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



DO NOT WRITE ON THIS PAGE



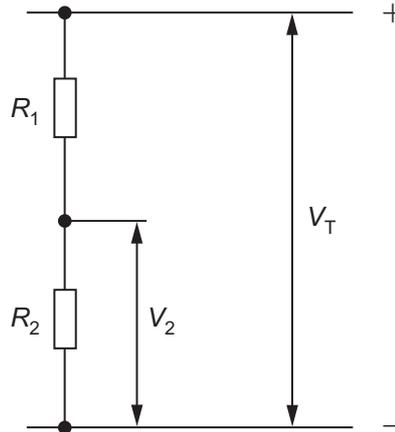
Formulae for GCSE Technology and Design

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

Parallel Resistors $\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2}$ or $R_T = \frac{R_1 \times R_2}{R_1 + R_2}$

4 Time Constant $T = R \times C$

[Turn over



Answer **all** questions

Examiner Only

Marks Remark

- 1 (a) (i) In the space below produce a sketch of the symbol for an NPN transistor.

[2]

- (ii) Clearly label and name each of the **three** legs of the transistor. [3]

- (iii) Outline how a transistor can be switched on when used in a circuit.

[2]

- (b) Fig. 1 shows a Voltage Divider circuit diagram.

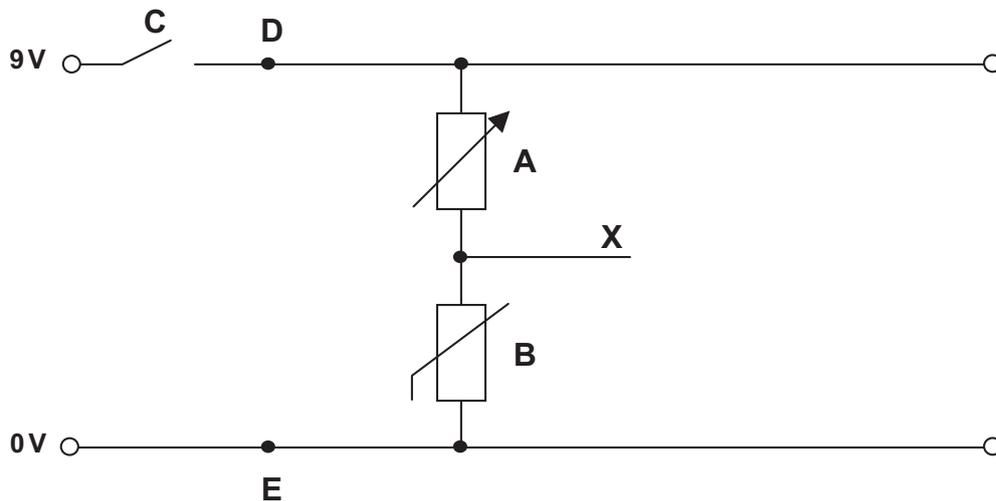


Fig. 1



(i) State another name for this circuit.

_____ [1]

(ii) Name the components shown by their electronic symbols **A** and **B** in **Fig. 1**.

A _____ [1]

B _____ [1]

(iii) What type of switch is shown at **C** in **Fig. 1**?

_____ [1]

(iv) With reference to the labelled components **A**, **B** and **C** in **Fig. 1** explain how an output at point **X** is achieved.

_____ [4]

(c) The circuit in **Fig. 1** is to be developed by including a resistor and a LED between the **9V** and **0V** rails at points **D** and **E**.

(i) Show this addition to the circuit in **Fig. 1**. [4]

(ii) With reference to the labelled component **C** explain how the additional parts will function in the circuit.

_____ [4]

Examiner Only

Marks Remark

[Turn over



2 Fig. 2 shows a circuit board with a microcontroller circuit.

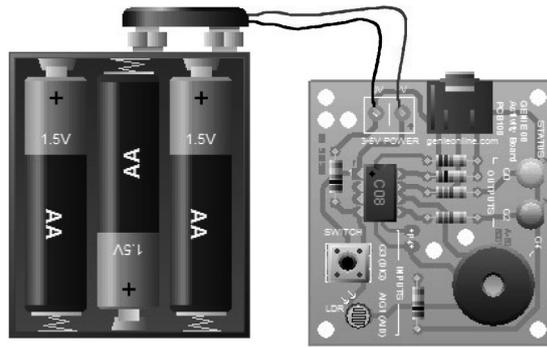


Fig. 2

© New Wave Concepts Ltd

(a) Suggest a method of modelling an electronic circuit.

_____ [1]

(b) Suggest a benefit of using this method of modelling.

 _____ [2]

(c) Analogue and digital inputs are used in microcontroller circuits. They are usually defined by how they function within a circuit.

Outline the difference between a digital and analogue input signal.

 _____ [2]

Examiner Only

Marks Remark

[Turn over



- (f) A student is to design an electronic circuit for a rotating night-light using a PIC microprocessor. The night light is to operate automatically once the toggle switch is turned on. An LDR will act as a sensor to determine when the room becomes dark. The PIC microprocessor will control a motor and some LEDs.

The PIC has 2 inputs and 5 outputs.

The inputs and outputs are shown in **Tables 2** and **3**.

When the room is dark the LDR input will be high.

Binary 1 indicates high (on) and binary 0 indicates low (off).

Digital Panels

Table 2

BIT	1	0
PIC Input	Toggle Switch	LDR

Table 3

BIT	4	3	2	1	0
PIC OUTPUT	Motor	Blue LED	Green LED	Yellow LED	Red LED

Examiner Only

Marks Remark

[Turn over



THIS IS THE END OF THE QUESTION PAPER





DO NOT WRITE ON THIS PAGE

8116



16GTD2115

DO NOT WRITE ON THIS PAGE

For Examiner's use only	
Question Number	Marks
1	
2	

Total Marks	
--------------------	--

Examiner Number

Permission to reproduce all copyright material has been applied for.
In some cases, efforts to contact copyright holders may have been unsuccessful and CCEA will be happy to rectify any omissions of acknowledgement in future if notified.

113213



16GTD2116