



Rewarding Learning

General Certificate of Secondary Education
2014

Centre Number

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Candidate Number

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Technology and Design

Unit 2:
Systems and Control

Element 1: Electronic and
Microelectronic Control Systems



[GTD21]

GTD21

TUESDAY 3 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.

Questions which require drawing or sketching should be completed using an HB pencil. All other questions must be completed in blue or black ink only. **Do not write in pencil or 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.



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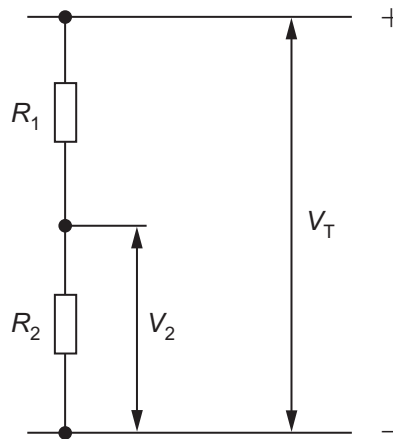
Formulae for GCSE Technology and Design

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

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

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Answer **all** questions.

- 1 (a) With reference to integrated circuits what does DIL mean? Explain with the aid of a sketch how pin one can be identified.

DIL _____ [1]

Sketch

Identity of pin one _____

_____ [2]

- (b) (i) Calculate the value of the single resistor which could replace the three resistors shown in **Fig. 1** below.

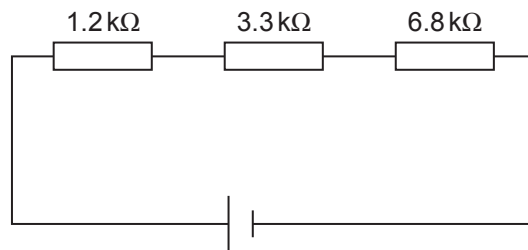


Fig. 1

Calculation

[2]

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(ii) Using the colour code below identify the colour of the first three bands of the 6.8 kΩ resistor shown in Fig. 1.

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

Colour of Band 1 _____

Colour of Band 2 _____

Colour of Band 3 _____ [3]

(iii) Calculate the combined value of the two resistors shown in Fig. 2 below. Each resistor has a value of 6.8 kΩ.

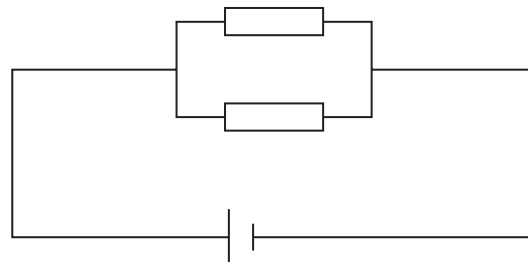


Fig. 2

Calculation

[3]

(iv) Calculate the maximum and minimum values that the 6.8 kΩ resistor may have if it has a 5% tolerance.

Calculation

[3]

[Turn over



(v) Complete the sentence below by inserting the missing words.

The resistors in **Fig. 1** are said to be connected in _____
 while the resistors in **Fig. 2** are said to be connected in _____.

[2]

(c) The potential divider circuit in **Fig. 3** is often used in preference to the potential divider circuit shown in **Fig. 4**.

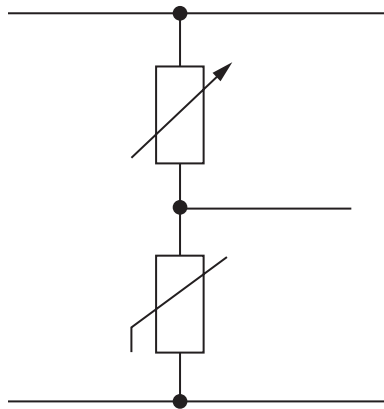


Fig. 3

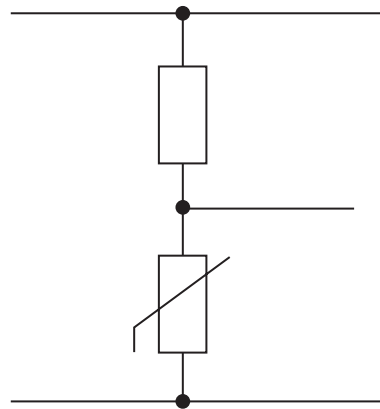


Fig. 4

State the difference between the two potential divider circuits shown and explain why the potential divider circuit shown in **Fig. 3** would be used in preference to the potential divider circuit shown in **Fig. 4**.

Difference _____ [1]

Explanation _____

_____ [2]

Examiner Only	
Marks	Remark



(iii) Name the integrated circuit (IC) component used in the circuit to provide the output.

_____ [1]

(iv) Outline what is meant by the term time constant.

_____ [2]

(v) Use the capital letters **A** and **B** to clearly mark on **Fig. 5** the two components used to provide the time constant. [2]

(vi) Name the **two** components used in the circuit to provide the time constant.

_____ [2]

(vii) Outline how the time constant in this circuit can be changed.

_____ [2]

(viii) An LED is to be fitted in the circuit to indicate when the output is high. Complete the circuit in **Fig. 5** so that the LED will operate as described. [6]

Examiner Only

Marks Remark

Total Question 1



Tables 1 and 2 show the inputs and outputs which are used in the PIC circuit.

Table 1

PIC Inputs	Not used	Not used	Start/Play Switch	Display Switch	Loop Contacts Steel Wire
BIT	4	3	2	1	0

Table 2

PIC Outputs	Not used	Not used	Not used	Buzzer	Not used	Green LED	Yellow LED	Red LED
BIT	7	6	5	4	3	2	1	0

Examiner Only

Marks Remark

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(i) Macro 1 DISPLAY

A display showing 3 different coloured LEDs will operate when the display switch is turned on.

Complete the **DISPLAY** macro in **Fig. 8**. When the display switch is turned on a red LED will turn on. Then after 0.5 seconds a yellow LED will turn on and after another 0.5 seconds a green LED will turn on. When all the LEDs are on the macro ends.

Beside each input and output cell, indicate the relevant bit pattern.

	DISPLAY			BIT PATTERN
	↓			

Fig. 8

[10]

Examiner Only	
Marks	Remark



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Question Number	Marks
1	
2	

Total Marks	
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Examiner Number

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