OCR
Oxford Cambridge and RSA

Monday 5 June 2017 – Afternoon

LEVEL 1/2 CAMBRIDGE NATIONAL IN SYSTEMS CONTROL IN ENGINEERING

R113/01   Electronic principles

Candidates answer on the Question Paper.

OCR supplied materials:
None

Other materials required:
•   A calculator may be used

Duration: 1 hour

Candidate forename		Candidate surname	

Centre number					Candidate number				

INSTRUCTIONS TO CANDIDATES

•   Use black ink. HB pencil may be used for graphs and diagrams only.
•   Complete the boxes above with your name, centre number and candidate number.
•   Answer **all** the questions.
•   Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
•   Do **not** write in the barcodes.

INFORMATION FOR CANDIDATES
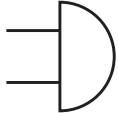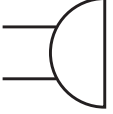
•   The total number of marks for this paper is **60**.
•   The number of marks for each question is given in brackets **[ ]** at the end of the question or part question.
•   Dimensions are in millimetres unless stated otherwise.
•   Quality of written communication will be assessed in questions marked with an asterisk (*).
•   This document consists of **8** pages. Any blank pages are indicated.

A calculator may be used for this paper

OCR is an exempt Charity

Turn over

2
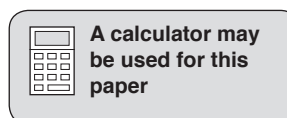
Answer **all** questions

1 **(a)** Complete the table by using words from the list below.

Ammeter
And Gate
Bell
Bridge
Buzzer

Symbol	Component

[2]

(b) Name the quantity that is being measured when a voltmeter is connected across a 2 V cell.

    E………………………   M……………………..   F……………………..   **[1]**

(c) A resistor has a current flowing through it of 0.2 A and a voltage across it of 2 V.
Calculate the value of the resistor in ohms.

....

.... **[2]**

(d) Give **three** reasons why you would select solar power over other forms of power source.

1...

....

2...

....

3...

....

[3]

(e) State **two** advantages of using rechargeable batteries as compared to non-rechargeable batteries.

1..

....

2..

....

[2]

2 (a) Complete the **three** missing values of the preferred E12 series resistor series shown below.

| 10 | 12 | | 18 | 22 | 27 | | 39 | 47 | 56 | | 82 |

[1]

(b) Calculate the maximum and minimum value a resistor will have if it is rated at $120\,\Omega \pm 10\%$.

Maximum value ....

....

....

Minimum value ....

....

....

[3]

(c) (i) Explain with the aid of a diagram what is meant by the term 'Darlington Pair'.

....

....

....

.... **[4]**

Turn over

(ii) A Darlington Pair is used as part of a moisture detector circuit.
State the name of **two** other circuits that could use a Darlington Pair.

1 ....

2 ....

[2]

3 **(a)** Describe, using **one** example, what is meant by the term 'latching switch'.

....

....

....

.... **[2]**

(b) Draw a labelled circuit diagram to show how a Double Pole Double Throw (DPDT) switch can be used to control the direction of rotation of a DC motor.

[5]

(c) **(i)** State the meaning of the term 'Shape Memory Alloy (SMA)'.

....

.... **[1]**

(ii) Give the name of **two** Shape Memory Alloys.

1 ....

....

2 ....

....

[2]

4 **(a)** Fig. 1 shows a logic gate circuit being used by a test technician.
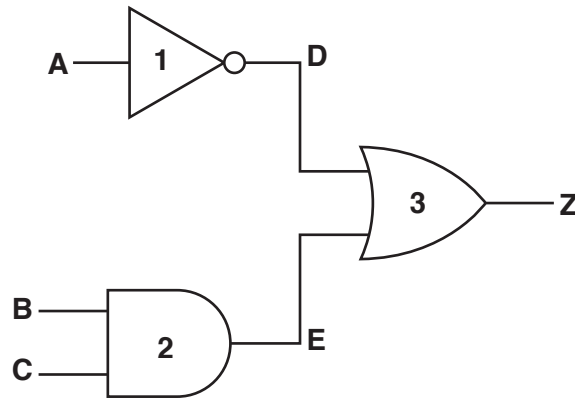
Fig. 1

(i) State the name of each of the logic gates in Fig. 1.

Gate **1** ....

Gate **2** ....

Gate **3** ....

[3]

(ii) Complete the table below with the test results the technician should obtain.

Input A	Input B	Input C	D	E	Z
0	0	0			
0	0	1			
0	1	0			
0	1	1			
1	0	0			
1	0	1			
1	1	0			
1	1	1			

[3]

Turn over

(b) State **four** types of fault that are often found when a visual inspection of a completed printed circuit board (PCB) takes place.

1...

2...

3...

4...

[4]

5 **(a)** Explain what is meant by the term 'Surface Mount Technology'.

....

....

.... **[2]**

(b) State **three** benefits and **three** drawbacks of using surface mount components in commercial circuit construction.

Benefit 1 ....

....

Benefit 2 ....

....

Benefit 3 ....

....

Drawback 1...

....

Drawback 2...

....

Drawback 3...

....

[6]

(c) Complete the table with a tick (✓) to identify which **two** statements are correct for quality assurance methods used during commercial printed circuit board production.

Quality Assurance Method	tick (✓)
Half split method	
Visual inspection	
Automatic test	
Truth table test	

[2]

6 A cable of resistance 0.05 Ω carries a current of 2A.

(a) (i) Calculate the power in watts absorbed by the cable.

....

....

....

.... [3]

(ii) Calculate the energy in watt hours consumed by the cable if it is in use for **three** hours.

....

.... [1]

Question 6(b)* begins on page 8

Turn over

(b)* Discuss the applications of solid core cables, multi-core cables and ribbon cables.

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

.... **[6]**

END OF QUESTION PAPER