



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	
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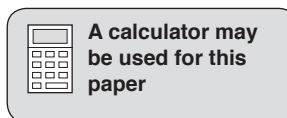
Centre number							Candidate number				
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**INSTRUCTIONS TO CANDIDATES**

- 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**

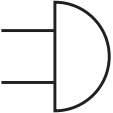
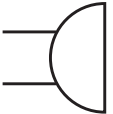
- The total number of marks for this paper is **60**.
- The number of marks for each question is given in brackets [ ] at the end of the question or part question.
- Dimensions are in millimetres unless stated otherwise.
- Quality of written communication will be assessed in questions marked with an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



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]**

(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.

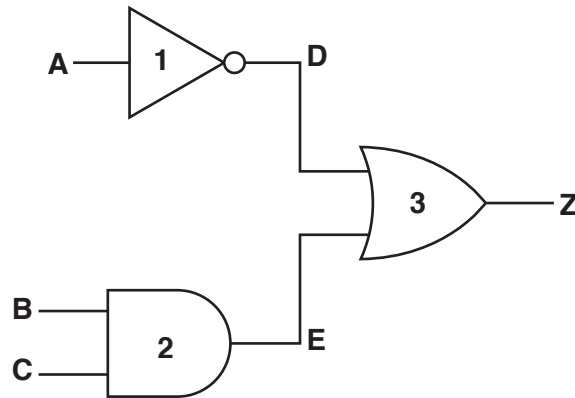


Fig. 1

(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]

(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  $0.05\ \Omega$  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**

