

**OCR**

Oxford Cambridge and RSA

**Thursday 12 January 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. If additional space is required, you should use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.
- 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.
- Your quality of written communication will be assessed in questions marked with an asterisk(\*).
- This document consists of **12** pages. Any blank pages are indicated.



**A calculator may  
be used for this  
paper**

Answer **all** questions.

1 (a) Name **two** types of power sources that can be used as a supply for electronic circuits.

1 .....

2 ..... [2]

(b) A  $6.8\Omega$  resistor has a voltage across it of 9V.  
Calculate the current flowing through it.

.....

..... [2]

(c) Calculate the power input to a motor taking 8A from a 12V dc supply.

.....

..... [2]

(d) Calculate the energy used in **three** hours by a 500W heater.

.....

..... [2]

(e) The total resistance of **two** resistors connected in series is  $24.2\Omega$ .  
If the value of one resistor is  $22\Omega$  calculate the value of the other resistor.

.....

..... [2]

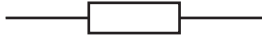
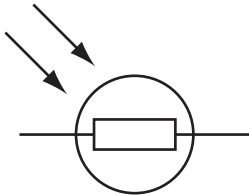
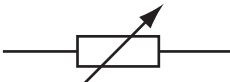

2 (a) Describe, giving **one** example, what is meant by the term ‘momentary action switch’.

.....

.....

..... [2]

(b) Complete the table below by naming each component from its symbol.

Symbol	Component
	
	
	
	

[4]

(c) (i) Draw the symbol for a fuse in the space below.

[1]

(ii) State **two** benefits of using a fuse for circuit protection.

1 .....

.....

2 .....

.....

[2]

(iii) State **one** reason for using a residual current device (RCD) for circuit protection.

.....

..... [1]

3 (a) Complete the table using a tick (✓) to identify the **three** input devices.

Device	Input
Moisture sensor	
Pressure switch	
Solenoid	
Touch screen	
Signal lamp	
LED 7 segment display	

[3]

(b) Complete the truth table shown below for a two-input NAND and two-input XOR gate.

Input A	Input B	NAND gate output	XOR gate output
0	0		
0	1		
1	0		
1	1		

[2]

(c) Fig 1. Shows a logic circuit made from three NAND gates.

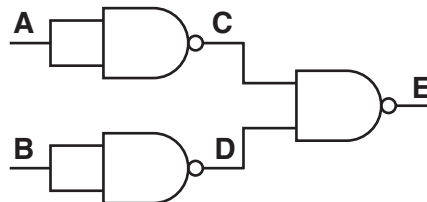


Fig. 1

(i) Complete the truth table for the circuit in Fig. 1.

A	B	C	D	E
0	0			
0	1			
1	0			
1	1			

[2]

(ii) Identify the logic gate produced by the circuit in Fig. 1.

..... [1]

(d) Describe how quantum tunneling composite (QTC) is used as a switch.

.....

.....

.....

.....

.....

.....

..... [2]

4 (a) State the names of **three** items of equipment that can be used when testing electronic circuits.

1 .....

2 .....

3 .....

[3]

(b) Draw a circuit diagram in the space below, to include the following components:

- a battery
- a resistor
- a meter to measure current flow in the circuit
- a meter to measure potential difference across the resistor.

[4]

(c) Explain the function of a voltage regulator.

.....

.....

.....

.....

..... [3]

7

- 5 (a) Use sketches and notes to describe how a through hole resistor is fitted and soldered to a printed circuit board.

.....

.....

.....

..... [6]

- (b) Fig. 2 shows a partly completed circuit diagram.

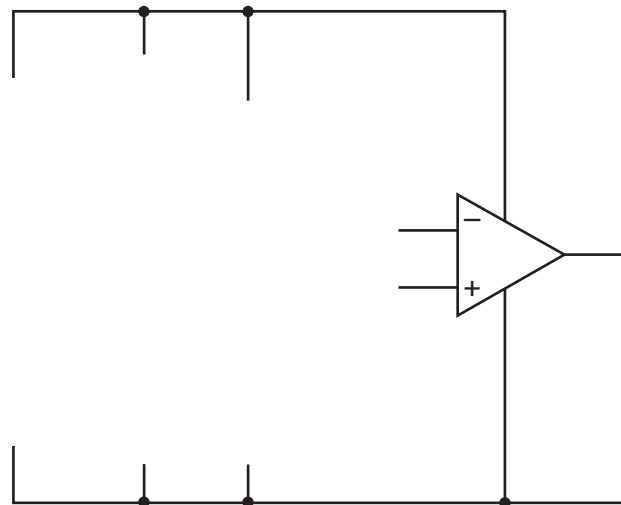


Fig. 2

Complete the circuit diagram by adding the following components:

- a 6 V battery for the supply
- a  $10\text{k}\Omega$  variable resistor connected to the inverting terminal of the operational amplifier (op amp)
- a  $5\text{k}\Omega$  variable resistor connected to the non-inverting terminal of the op amp
- a light emitting diode (LED) with a  $470\Omega$  protective resistor as an output device.

[4]





**ADDITIONAL ANSWER SPACE**

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).

A large area of lined paper for writing, consisting of 25 horizontal dotted lines. A solid vertical line runs down the left side of the page, creating a margin. The rest of the page is open for writing.

A blank sheet of lined paper. On the left side, there is a solid vertical line that serves as a margin. The rest of the page is filled with horizontal dotted lines, providing a guide for writing. The lines are evenly spaced and extend across the width of the page.

A blank sheet of lined paper. On the left side, there is a solid vertical line that serves as a margin. The rest of the page is filled with horizontal dotted lines, providing a guide for writing. The lines are evenly spaced and extend across the width of the page.

A large area of the page is reserved for writing, featuring a vertical solid line on the left side and horizontal dotted lines extending across the page.



**Copyright Information**

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website ([www.ocr.org.uk](http://www.ocr.org.uk)) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.