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

R113/01

6700274956

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

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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 Ω resistor has a voltage across it of 9 V.
Calculate the current flowing through it.

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..... **[2]**

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

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..... **[2]**

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

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..... **[2]**

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

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..... **[2]**

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

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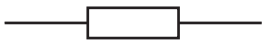
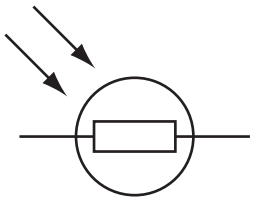
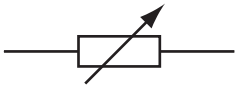
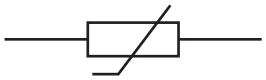
..... **[2]**

(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.

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..... **[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.

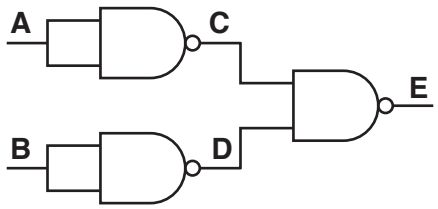

Fig. 1

(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.

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..... **[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.

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..... **[3]**

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

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..... **[6]**

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

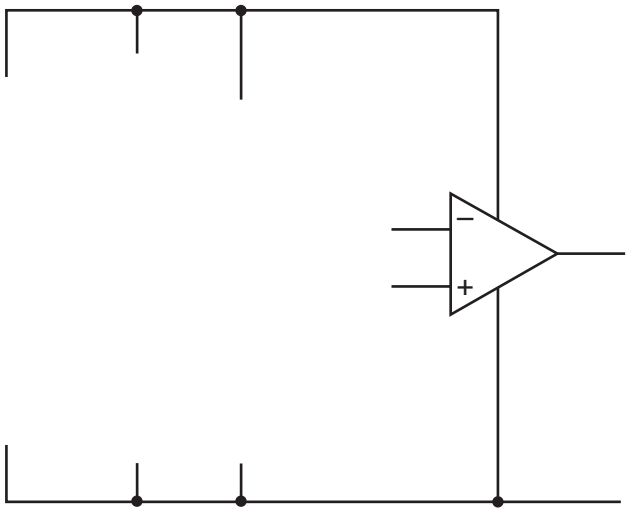

Fig. 2

Complete the circuit diagram by adding the following components:

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

[4]

6 Fig. 3 shows a control system.

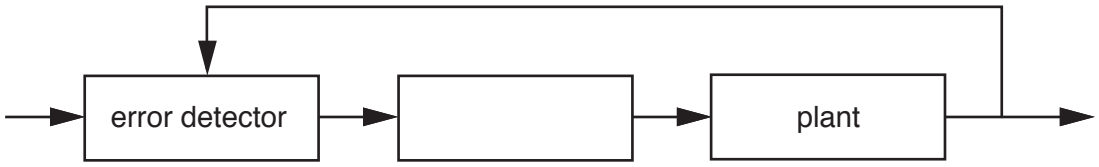

Fig. 3

(a) Label Fig. 3 with the terms; 'feedback path', 'input', 'output' and 'process'. **[4]**

(b)* Discuss the function and applications of photodiodes and phototransistors in electronic circuits.

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..... **[6]**

END OF QUESTION PAPER

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).