

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS**  
**LEVEL 1/2**  
**R113/01**  
**CAMBRIDGE NATIONAL IN SYSTEMS**  
**CONTROL IN ENGINEERING**  
**Electronic principles**

**MONDAY 4 JUNE 2018: Afternoon**  
**DURATION: 1 hour**  
**plus your additional time allowance**

**MODIFIED ENLARGED**

<b>Candidate forename</b>		<b>Candidate surname</b>	
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<b>Centre number</b>						<b>Candidate number</b>				
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**Candidates answer on the Question Paper.**

**OCR SUPPLIED MATERIALS:**

**None**

**OTHER MATERIALS REQUIRED:**

**A calculator may be used**

<b>A CALCULATOR MAY BE USED FOR THIS PAPER</b>
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**READ INSTRUCTIONS OVERLEAF**



## **INSTRUCTIONS TO CANDIDATES**

**Use black ink. HB pencil may be used for graphs and diagrams only.**

**Complete the boxes on the front page 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).**

## **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 (\*).**

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**Answer ALL the questions.**

- 1 (a) Complete the table by drawing the graphical symbol for each component listed. [4]**

<b>Component</b>	<b>Symbol</b>
<b>AND Gate</b>	
<b>Capacitor</b>	
<b>Fuse</b>	
<b>Buzzer</b>	

- (b) Calculate the current, in amps, flowing through a  $100\Omega$  resistor connected across a 2V supply.**

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[3]

- (c) Calculate the power, in watts, absorbed by a heater of resistance  $220\ \Omega$  when a current of  $2\text{ A}$  is flowing.

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[3]

- 2 (a) Complete the table below using a tick (✓) to identify FOUR output devices. [4]

Component	Output device
Solenoid	
Liquid Crystal Display module	
Microphone	
Piezo-electric buzzer	
Pressure switch	
Seven Segment display	
NCT thermistor	

- (b) The frequency of oscillation in an astable circuit is given by  $f = 1/(1.38 RC)$  where R is in ohms and C is in farads.  
Calculate the frequency of oscillation in Hertz given that  $R = 110\text{ k}\Omega$  and  $C = 3.3\text{ }\mu\text{F}$ .

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [3]

**(c) Complete the truth table below for the following two-input gates: OR, AND, NAND. [3]**

<b>Input A</b>	<b>Input B</b>	<b>OR gate output</b>	<b>AND gate output</b>	<b>NAND gate output</b>
<b>0</b>	<b>0</b>			
<b>0</b>	<b>1</b>			
<b>1</b>	<b>0</b>			
<b>1</b>	<b>1</b>			

**3 (a) Different manufacturing processes are used in commercial circuit construction.**

**(i) Explain what is meant by the ‘flow (wave) solder’ process.**

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[2]

**(ii) Explain what is meant by the ‘pick and place robot’ process.**

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[2]



- (b) Draw lines to connect each activity to the correct sequence of events for soldering a surface mount resistor on to a printed circuit board (PCB). The first one has been done for you. [6]**

**SEQUENCE OF  
EVENTS**

**ACTIVITY**

**1**

**Apply flux to all pads on the circuit board.**

**2**

**The resistor should now be fastened on one side; apply solder to the soldering tip again and touch the iron tip on the other side.**

**3**

**Check that the tip of the soldering iron and the resistor are clean.**

**4**

**Inspect the solder joints with a magnifying glass to make sure the connection is good.**

**5**

**Place the resistor in position and hold it there with a pair of tweezers.**

**6**

**Touch the soldering tip so that it heats both the resistor and circuit board pad.**

**7**

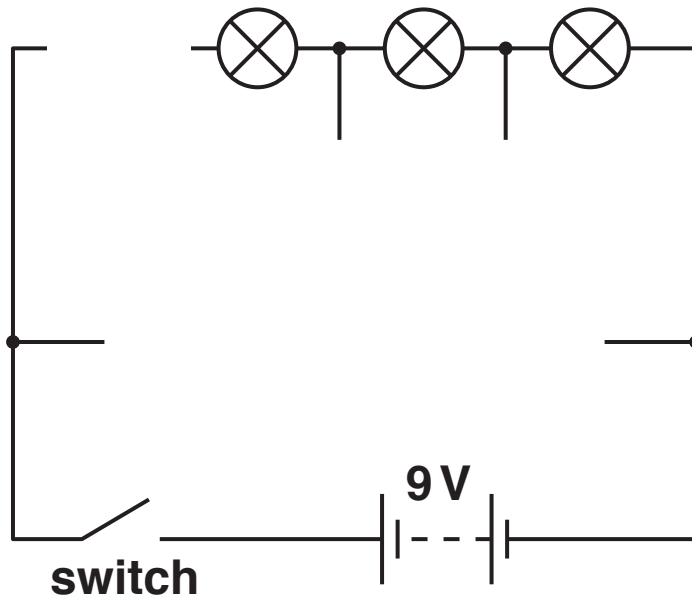
**Apply some solder to the tip of the iron and touch the circuit board pad with the tip so that some of the solder passes on to the pad.**

[illegible]

- (b) Draw a potential divider circuit consisting of a light dependent resistor (LDR) connected to a  $3.3\text{k}\Omega$  resistor. One end of the  $3.3\text{k}\Omega$  resistor is connected to a +5 V supply. Use the space below. [4]**

5 Fig. 1 shows an incomplete circuit diagram.

Fig. 1



(a) Complete the circuit diagram in Fig. 1 with:

an ammeter to measure total current flow

a voltmeter to measure the potential difference across one lamp

a voltmeter to measure the circuit electromotive force (EMF). [3]

- (b) (i) State the contact arrangement of the switch used in the circuit.**

\_\_\_\_\_ [1]

- (ii) State what type of lamp is used in the circuit.**

\_\_\_\_\_ [1]

- (c) (i) Calculate the total resistance of the lamps if each lamp has a resistance of  $1.8\ \Omega$ .**

\_\_\_\_\_  
\_\_\_\_\_ [2]

- (ii) Calculate the energy consumed in 10 hours by one lamp that is rated at 4 W.**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [3]

**6 (a) State the name of THREE techniques that are used to identify potential electrical hazards.**

**1** \_\_\_\_\_

\_\_\_\_\_

**2** \_\_\_\_\_

\_\_\_\_\_

**3** \_\_\_\_\_

\_\_\_\_\_

**[3]**

**(b) Give TWO reasons for using a virtual signal generator to test a simulated circuit.**

**1** \_\_\_\_\_

\_\_\_\_\_

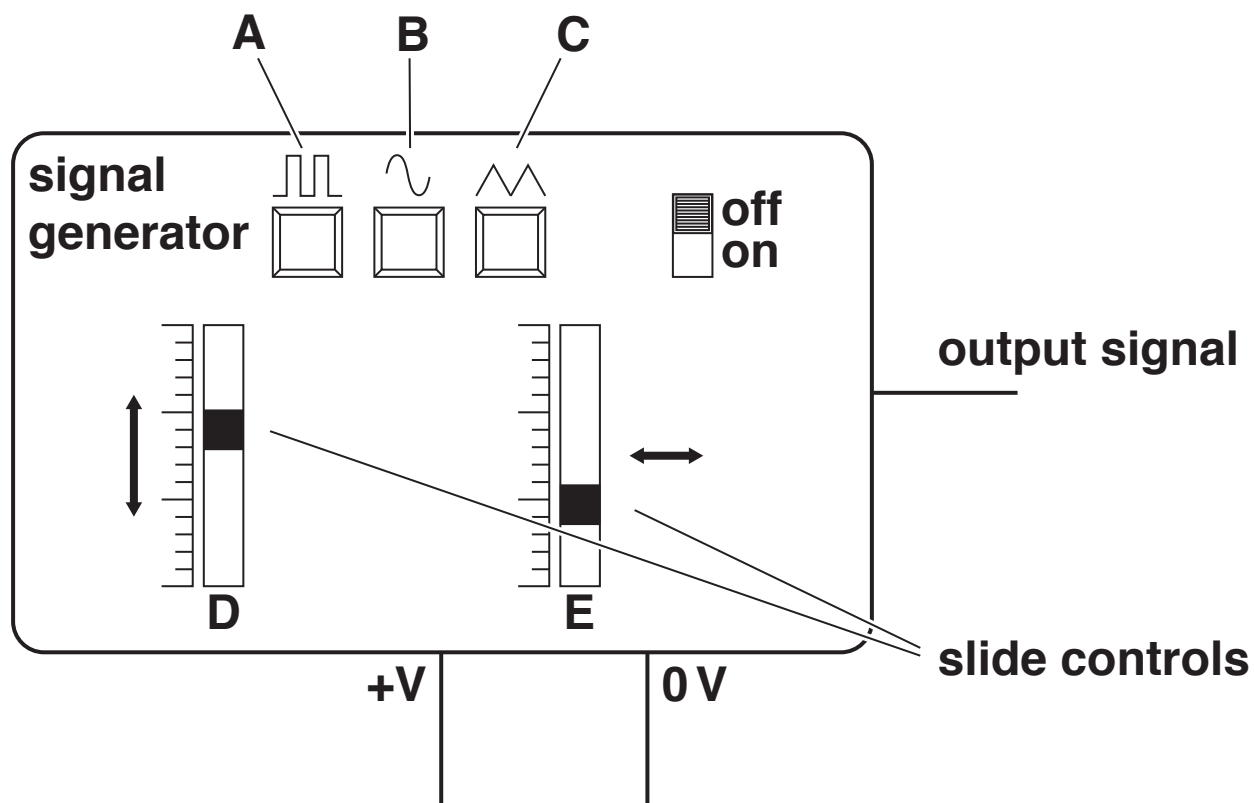
**2** \_\_\_\_\_

\_\_\_\_\_

**[2]**

(c) Fig. 2 shows a virtual signal generator.

Fig. 2



(i) State the name of the wave form at A, B and C in Fig. 2.

A \_\_\_\_\_

B \_\_\_\_\_

C \_\_\_\_\_

[3]

- (ii) Fig. 2 shows two slide controls, D and E.  
State the function of slide controls D and E.

D \_\_\_\_\_

E \_\_\_\_\_

[2]

**END OF QUESTION PAPER**



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