

**OCR**

Oxford Cambridge and RSA

**Wednesday 14 January 2015 – 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 bar codes.




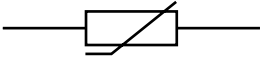
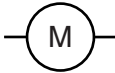
**INFORMATION FOR CANDIDATES**

- 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 **16** pages. Any blank pages are indicated.

2

Answer **all** questions.

1 (a) Complete the table by naming each component from its symbol shown.

Symbol	Component
	
	
	
	
	

[5]

(b) A potential difference of 2 volts is applied across the terminals of a 10 ohm resistor.

Calculate:

(i) The current flowing through the resistor.

.....

..... [2]

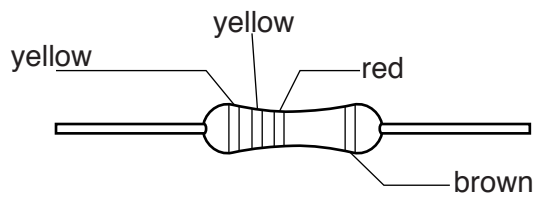
(ii) The power absorbed by the resistor.

.....

..... [2]

3

(c) Fig. 1 shows a fixed resistor and a resistor colour code chart.



Digit 1	Digit 2	Multiplier	Tolerance
black 0	black 0	black 0	brown 0.01
brown 1	brown 1	brown 1	red 0.02
red 2	red 2	red 2	gold 0.05
orange 3	orange 3	orange 3	
yellow 4	yellow 4	yellow 4	
green 5	green 5	green 5	
blue 6	blue 6	blue 6	
violet 7	violet 7	gold 0.1	
grey 8	grey 8	silver 0.01	
white 9	white 9		

Fig. 1

Use the resistor colour code chart to determine the value of the fixed resistor shown.

Resistor value = .....  $\Omega$

[1]

2 (a) Fig. 2 shows a circuit diagram.

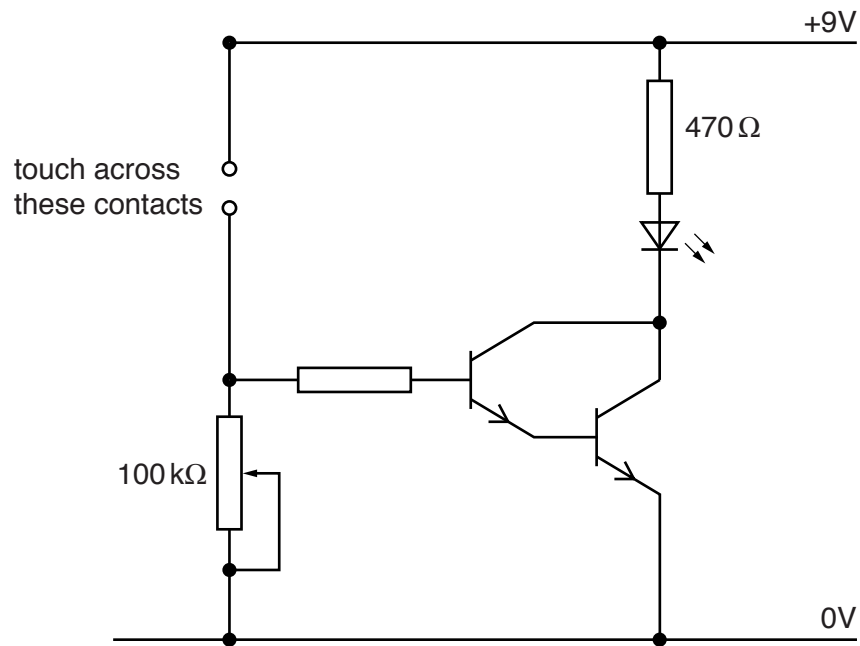


Fig. 2

- (i) Name the type of transistor that is being used in the circuit.  
 ..... [1]
- (ii) Give the name that is used for the combination of the two transistors shown.  
 ..... [1]
- (iii) What type of switch could be used instead of the 'touch across these contacts' layout?  
 ..... [1]
- (iv) Explain the purpose of the 470 Ω resistor used in this circuit.  
 .....  
 ..... [2]
- (v) Explain why a 100 kΩ potentiometer is used rather than a fixed resistor.  
 .....  
 ..... [2]

5

(b) Explain what happens to the Light Emitting Diode (LED) when the touch contacts are closed.

.....

.....

.....

.....

.....

.....

..... [3]

Turn over for next question.

6

- 3 (a) The list below shows four different capacitor values.

2.2  $\mu\text{F}$       2.2 nF      2.2 pF      2.2 F

- (i) State the lowest capacitance value in the list.

..... [1]

- (ii) State the highest capacitance value in the list.

..... [1]

- (b) State the precaution that needs to be taken when placing an electrolytic capacitor in a circuit.

..... [1]

- (c) Draw a labelled circuit diagram that could be used for charging and discharging a capacitor using a d.c. supply.

[3]

- (d) Explain what is meant by the term 'time constant' in an RC circuit.

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

- (e) A 47  $\mu\text{F}$  capacitor is connected in series with a 100 k $\Omega$  resistor to a 500V d.c. supply.

Calculate the time constant of the circuit.

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

7

**BLANK PAGE**

**Turn over for next question.**

**PLEASE DO NOT WRITE ON THIS PAGE**

4 (a) Fig. 3 shows a mains powered soldering iron.

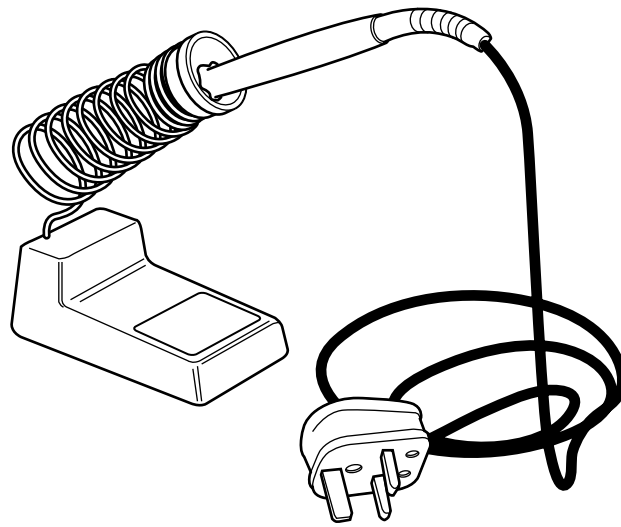


Fig. 3

Describe how a component can be connected in a circuit using a hand soldering method.

.....

.....

.....

..... [4]





5 (a) Fig. 4 shows a virtual oscilloscope being used as a test instrument in a simulated situation.

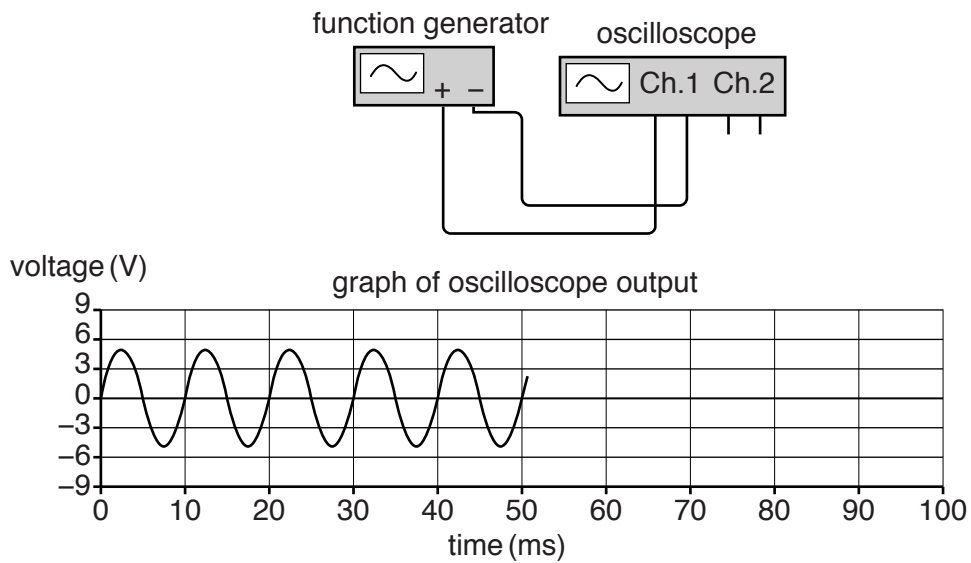


Fig. 4

(i) Name the waveform shown on the graph of the oscilloscope output.

..... [1]

(ii) Describe what happens to the shape of the output waveform if the X control on the oscilloscope is increased or decreased.

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

(iii) Describe what happens to the shape of the output waveform if the Y control on the oscilloscope is increased or decreased.

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

(b) One method of finding a fault in an electronic circuit is by using test equipment.

(i) Other than an oscilloscope, name **three** items of test equipment that are used to find a fault in an electronic circuit.

1 .....

2 .....

3 .....

[3]

(ii) Explain what is meant by the 'half split' method to find a break in the circuit.

.....

.....

.....

.....

..... [2]

6 (a) Fig. 5 is a block diagram of a control system.

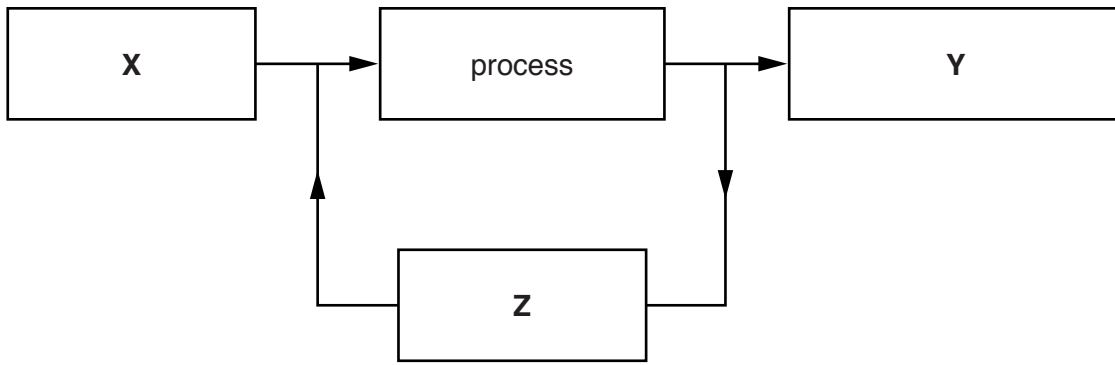


Fig. 5

State which block represents:

(i) feedback

.....

(ii) input

.....

(iii) output

.....

[3]

(b) The diagram is made up of four blocks.

(i) Explain the function of the process block.

.....

.....

.....

..... [2]

(ii) State whether the system is open loop or closed loop control.

..... [1]

(iii) Give a reason for your answer.

.....

..... [1]

(c) State **three** practical applications that use a closed loop control system.

1 .....

2 .....

3 .....

[3]

**END OF QUESTION PAPER**

14

**BLANK PAGE**

**PLEASE DO NOT WRITE ON THIS PAGE**

15

**BLANK PAGE**

**PLEASE DO NOT WRITE ON THIS PAGE**

**PLEASE DO NOT WRITE ON THIS 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.