



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	
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Centre number						Candidate number				
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INSTRUCTIONS TO CANDIDATES




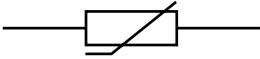
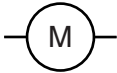
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Complete the boxes above with your name, centre number and candidate number.
- Answer **all** the questions.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the 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.

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:

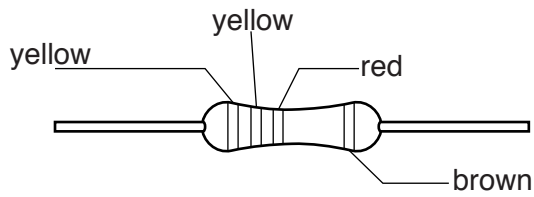
(i) The current flowing through the resistor.

.....
 [2]

(ii) The power absorbed by the resistor.

.....
 [2]

(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 = Ω

[1]

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

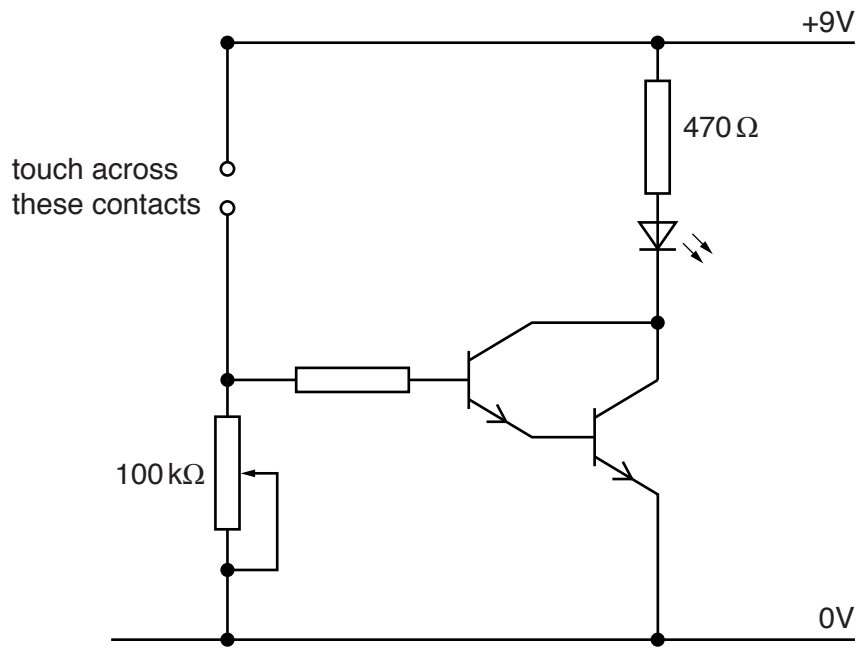


Fig. 2

- (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 470Ω resistor used in this circuit.

 [2]
- (v) Explain why a 100kΩ potentiometer is used rather than a fixed resistor.

 [2]

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

.....

.....

.....

.....

.....

.....

..... [3]

Turn over for next question.

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

2.2 μF 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 μF capacitor is connected in series with a 100 k Ω resistor to a 500V d.c. supply.

Calculate the time constant of the circuit.

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

7

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Turn over for next question.

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

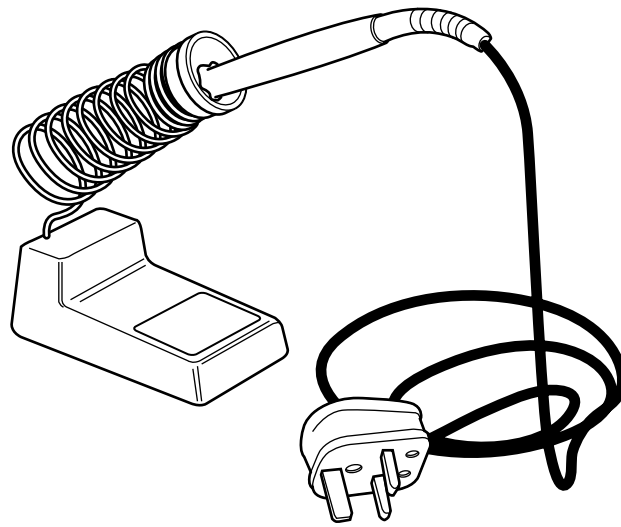


Fig. 3

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.

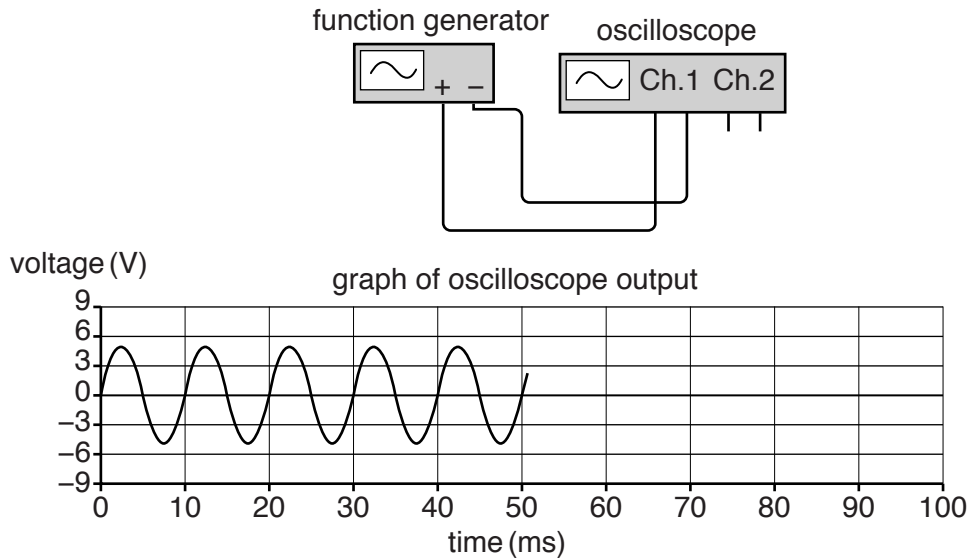


Fig. 4

(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.

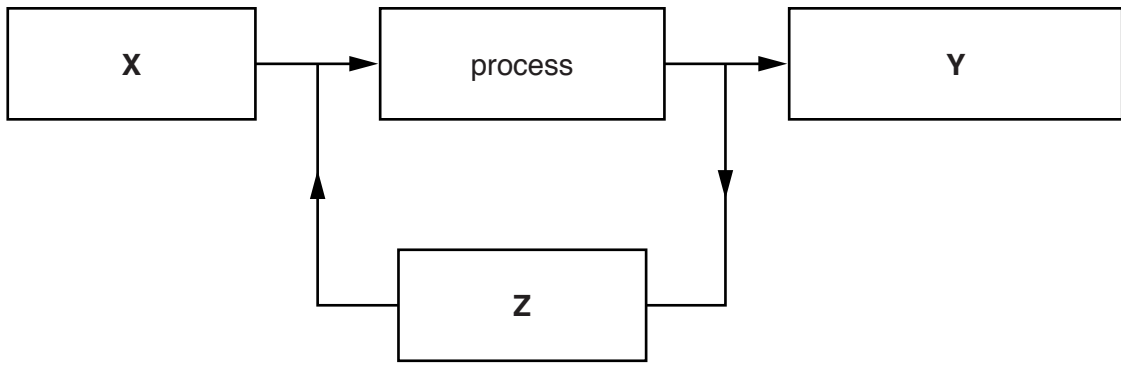


Fig. 5

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

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