

**OCR**

Oxford Cambridge and RSA

**Thursday 11 January 2018 – 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. 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 **8** pages. Any blank pages are indicated.



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

2

Answer **all** the questions.

- 1 (a) Complete the table by naming the unit for each quantity shown.

Quantity	Unit
Energy	
Electro Motive Force	
Frequency	
Inductance	

[4]

- (b) Two resistors of value  $3\Omega$  and  $2\Omega$  are connected in parallel to a 6V supply.

Calculate:

- (i) total circuit resistance

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

- (ii) total power used in the circuit.

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

- 2 (a) Explain the difference between a polarised capacitor and a non-polarised capacitor.

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

(b) (i) State the type of capacitor shown in Fig. 1.

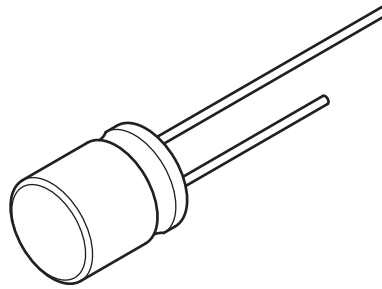


Fig. 1

..... [1]

(ii) Give the reason for one capacitor leg being shorter than the other.

..... [1]

(c) (i) Explain what is meant by voltage rating in a capacitor.

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

(ii) Explain the meaning of tolerance in a capacitor.

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

(d) A  $100\mu\text{F}$  capacitor has a tolerance of  $\pm 20\%$ .

Calculate the maximum and minimum values for the capacitor.

Maximum value .....

Minimum value .....

[2]

3 Fig. 2 shows a block diagram of a control system for varying the set level of temperature.

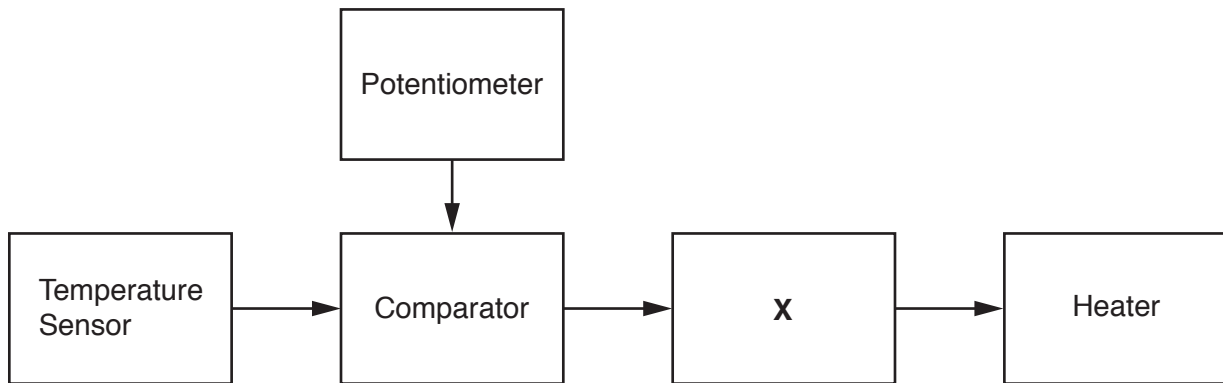


Fig. 2

The 230 V mains controlled heater switches on when the temperature falls below a set value.

(a) State which of the blocks is:

(i) an input

..... [1]

(ii) an output

..... [1]

(iii) a process

..... [1]

(iv) a control for varying the temperature.

..... [1]

(b) State the block in which:

(i) a relay could be used

..... [1]

(ii) a thermistor could be used

..... [1]

(iii) an operational amplifier (op-amp) could be used.

..... [1]

(c) Explain why the 230 V 1000 W heater is not directly connected to the comparator.

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





6 (a) State **six** benefits of pick and place robots in manufacturing processes.

1.....  
.....

2.....  
.....

3.....  
.....

4.....  
.....

5.....  
.....

6.....  
.....

[6]

(b) Calculate the current, in amperes, taken from a pick and place robotic motor rated at 2kW 230V.

.....  
.....

[2]

(c) Calculate the energy consumed in 10 hours by a robot arm servomechanism that is rated at 4kW.

.....  
.....

[2]

**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).

A large rectangular area with a vertical solid line on the left side and horizontal dotted lines across the rest of the page, providing space for writing answers.



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