



Oxford Cambridge and RSA

Thursday 11 January 2018 – Afternoon

**LEVEL 1/2 CAMBRIDGE NATIONAL IN SYSTEMS CONTROL
IN ENGINEERING**

R113/01 Electronic principles

7301549165*

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

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 3Ω and 2Ω 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.

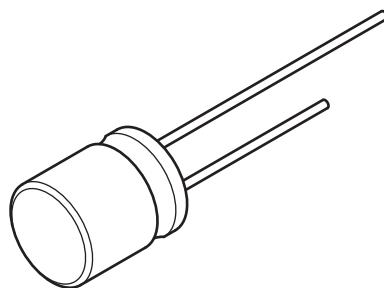


Fig. 1

..... [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.

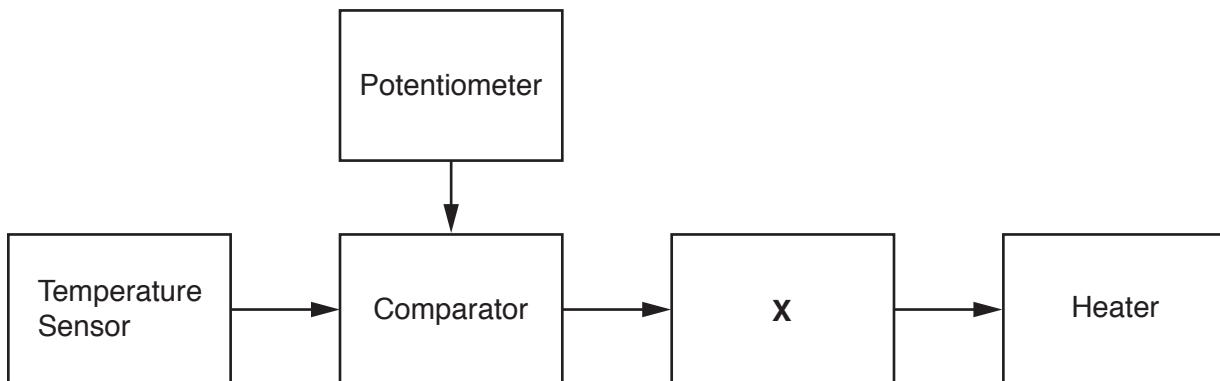


Fig. 2

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]

4 (a) State the full names of the switches given as initials.

(i) SPDT

[11]

(ii) SPST

[11]

(iii) DPDT

[11]

(iv) DPST

..... [1]

(b)* Discuss the function and applications of a momentary action switch and a latching switch.

5 (a) Complete the table with a tick (✓) to identify which **four** items can be used to test an electronic circuit for faults.

Test Equipment	
Power Supply Unit	✓
Diode	
Logic probe	
Relay	
Signal Generator	
Solenoid	
Multimeter	

[4]

(b) Describe, in detail, how a continuity test can be carried out on an electronic circuit.

[6]

[6]

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).



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