



Oxford Cambridge and RSA

Tuesday 12 January 2021 – Afternoon

Level 1/2 Cambridge National in Systems Control in Engineering

R113/01 Electronic principles

Time allowed: 1 hour



You can use:

- a scientific or graphical calculator



Please write clearly in black ink. **Do not write in the barcodes.**

Centre number

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Candidate number

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First name(s)

Last name

INSTRUCTIONS

- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. If you need extra space, use the lined pages at the end of this booklet. The question numbers must be clearly shown.
- Answer **all** the questions.

INFORMATION

- The total mark for this paper is **60**.
- The marks for each question are shown in brackets [].
- Quality of written communication will be assessed in questions marked with an asterisk (*).
- This document has **12** pages.

ADVICE

- Read each question carefully before you start your answer.

Answer **all** the questions.

1 Fig. 1 shows a circuit diagram.

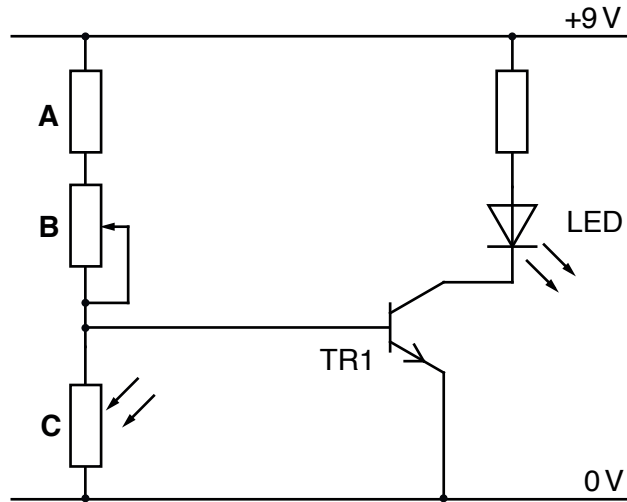


Fig. 1

(a) Name the components **A**, **B** and **C**.

A

B

C

[3]

(b) (i) State the full name of the LED.

L E D [1]

(ii) Describe the operating principle of an LED.

.....

.....

..... [2]

(c) State the name of the type of transistor TR1 shown in Fig. 1.

..... [1]

(d) **Circle** **three** of the following components that could replace the LED and resistor as an output in Fig. 1.

- | | | |
|--------|-------------|--------------------------|
| bell | photodiode | Light Dependent Resistor |
| buzzer | signal lamp | thermistor |

[3]

2 Fig. 2 shows an RC series circuit.

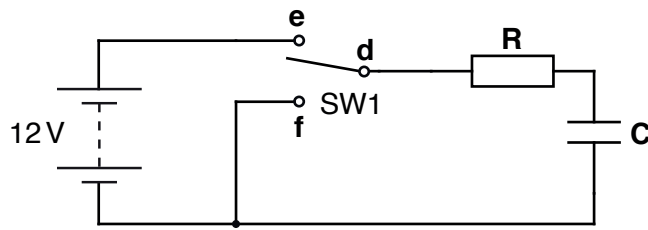


Fig. 2

(a) State which **two** contacts on SW1 must be connected for the capacitor to be charged.

..... [1]

(b) Calculate the initial charging current in amps if **R** is $200\ \Omega$.

.....

 [3]

(c) Draw a curve on Fig. 3 to show the potential across capacitor **C** as it is discharging.



Fig. 3

[2]

(d) A $10\mu\text{F}$ capacitor is to be charged in series with a $0.2\text{M}\Omega$ resistor from a 100V supply.

Use the formula $T = RC$ to calculate the time constant T .

.....

.....

.....

.....

.....

.....

..... [4]

3 (a) Two resistors of value 3Ω and 2Ω are connected in parallel to a 12V supply.

(i) Calculate the total circuit resistance.

Use the formula $\frac{1}{R_{\text{total}}} = \frac{1}{R_1} + \frac{1}{R_2}$

.....

.....

.....

.....

..... [3]

(ii) Calculate the power dissipated by the 2Ω resistor.

Use the formula $P = \frac{V^2}{R}$

.....

.....

.....

.....

..... [3]

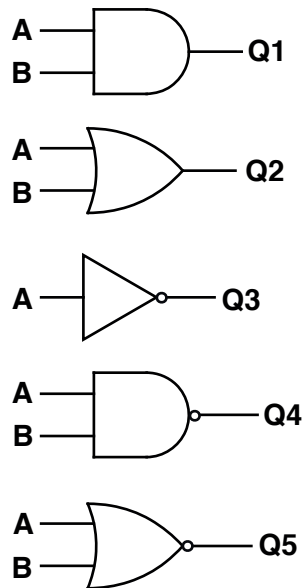
- 5 (a) Name **two** fault finding procedures other than the truth table method of testing, that can be used on electronic circuits.

1

2

[2]

- (b) A technician has used a logic probe to test the logic gates shown in Fig. 6. Complete the truth table with the result that the technician would expect to get from the test.



A	B	Q1	Q2	Q3	Q4	Q5
0	0					
0	1					
1	0					
1	1					

Fig. 6

[5]

6 (a) Name **two** commercial circuit construction methods other than the use of a pick and place robot.

1

2

[2]

(b) Name **three** functions of a pick and place robot.

1

2

3

[3]

(c) State **five** reasons why components are surface mounted rather than using the through hole system.

1

2

3

4

5

[5]

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 area of lined paper for writing. It consists of horizontal dotted lines spaced evenly down the page. A vertical solid line runs down the left side of the page, creating a margin. The lines extend across the width of the page.

A large rectangular area for writing, bounded by a solid vertical line on the left and horizontal dotted lines on the top, bottom, and right.



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