OCR
Oxford Cambridge and RSA

Tuesday 10 January 2023 – Afternoon

Level 1/2 Cambridge National in Systems Control in Engineering

R113/01 Electronic principles

Time allowed: 1 hour

9433202039

You must have:
- a scientific or graphical calculator

R113/01

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

Centre number | | | | | | Candidate number | | | | |

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 page at the end of this booklet. The question numbers must be clearly shown.
- Answer **all** the questions.

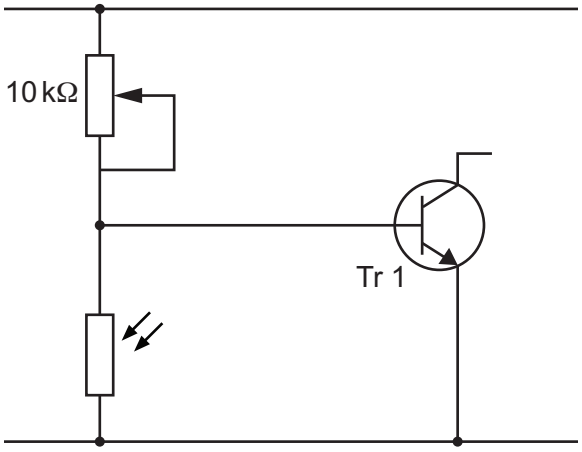
INFORMATION
- The total mark for this paper is **60**.
- The marks for each question are shown in brackets **[ ]**.
- Quality of written communication will be assessed in questions marked with an asterisk (*).
- This document has **8** pages.

ADVICE
- Read each question carefully before you start your answer.

Answer **all** the questions.

1 **Fig. 1** shows a partly completed circuit diagram.

Fig. 1



(a) Complete the circuit diagram in **Fig. 1** by adding:

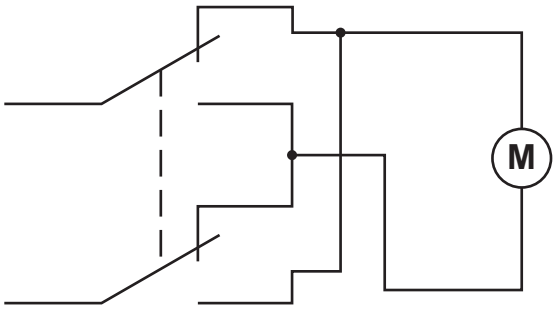
- a light emitting diode (LED) connected to Tr1
- a current limiting resistor for the LED
- +9 V and 0 V labels for the power supply rails.

[6]

(b) **Fig. 2** shows a switch being used to control the direction of rotation of a motor.

Complete the name of the switch type shown in **Fig. 2** that is being used to control the motor.

Fig. 2



Double Pole Double ..... **[1]**

(c) Calculate the total resistance of three resistors, each of value 10 Ω, connected in series.

Total resistance .....

.....

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

2 **(a)** State how you would identify the difference between a polarised capacitor and a non polarised capacitor when making a connection in a circuit.

.....

.....

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

(b) A capacitor colour code chart to give values in pF is shown in **Table 1** below.

Table 1

Band 1	Band 2	Band 3	Band 4
Black 0	Black 0	Black 0	Black ±20%
Brown 1	Brown 1	Brown 1	Brown ±1%
Red 2	Red 2	Red 2	Red ±2%
Orange 3	Orange 3	Orange 3	Gold ±5%
Yellow 4	Yellow 4	Yellow 4	Silver ±10%
Green 5	Green 5	Green 5	
Blue 6	Blue 6	Blue 6	
Violet 7	Violet 7		
Grey 8	Grey 8		
White 9	White 9		

(i) Write down the value of a capacitor colour coded Red, Brown, Orange and Gold. Gold has been completed for you.

Red indicates .....

Brown indicates .....

Orange indicates .....

Gold indicates ..... ± 5% .....

The capacitor value is ..... pF ± .....

[4]

(ii) Calculate the **minimum** and **maximum** value of a 200 pF ±5% capacitor.

Minimum value .....

.....

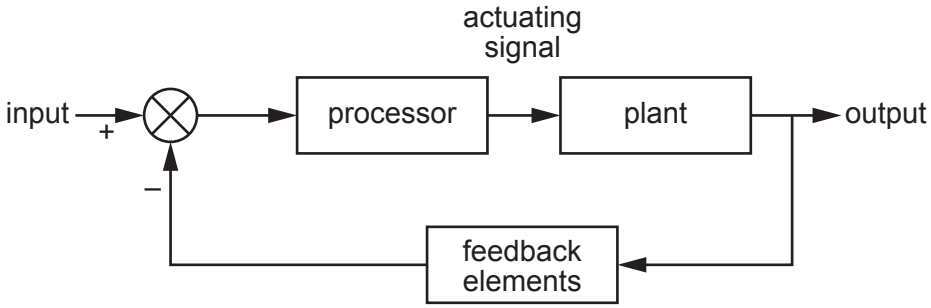
Maximum value .....

.....

[4]

3 **Fig. 3** is a block diagram of a control system.

Fig. 3



(a) State the type of control loop being used in the diagram shown in **Fig. 3**.

..... **[1]**

(b) State the purpose of input, output, processor and feedback elements in the system.

(i) Input .....

..... **[1]**

(ii) Output .....

..... **[1]**

(iii) Processor .....

.....

.....

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

(iv) Feedback elements .....

.....

.....

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

(c) Calculate the potential difference across a lamp if its resistance is 40 Ω and the current flow is 0.3 A.

.....

.....

.....

..... V **[3]**

4 **(a)*** Visual inspection is a technique used to identify potential electrical hazards in electronic circuits.

Discuss the **two** other techniques shown below that are used to identify hazards in electronic circuits:

- portable appliance testing (PAT) compliance
- use of residual current device (RCD).

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[6]

(b) List **four** items of electrical test equipment.

1 .....

2 .....

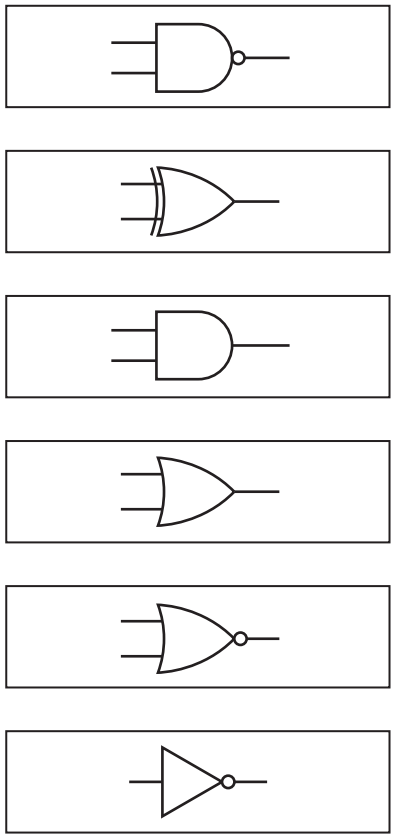
3 .....

4 .....

[4]

5 **Fig. 4** shows **six** logic gate symbols and **six** names of logic gates.

Fig. 4



AND
NOT
OR
NOR
XOR
NAND

(a) Draw a line between each logic gate symbol and its name. **[5]**

(b) Complete the truth table below for each of the **two** input gates listed.

Input A	Input B	AND gate output	OR gate output	NOR gate output	XOR gate output	NAND gate output
0	0					
0	1					
1	0					
1	1					

[5]

6 **(a)** Name **three** manufacturing processes that are used within commercial circuit construction.

1 .....

2 .....

3 .....

[3]

(b) Quality assurance methods are used to check a commercially produced printed circuit board (PCB) with components installed and soldered.

List **five** faults that could be found on a circuit board during a visual inspection.

1 .....

.....

2 .....

.....

3 .....

.....

4 .....

.....

5 .....

.....

[5]

(c) Complete the **two** missing values of the preferred E12 resistor series shown below.

	12	15	18	22	27	33		47	56	68	82

[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).