OCR
Oxford Cambridge and RSA

Friday 10 June 2022 – Afternoon

Level 1/2 Cambridge National in Systems Control in Engineering

R113/01 Electronic principles

Time allowed: 1 hour

You must have:
• a scientific or graphical calculator

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 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.

Turn over

Answer **all** the questions.

1 **Fig. 1** shows an incomplete circuit diagram.

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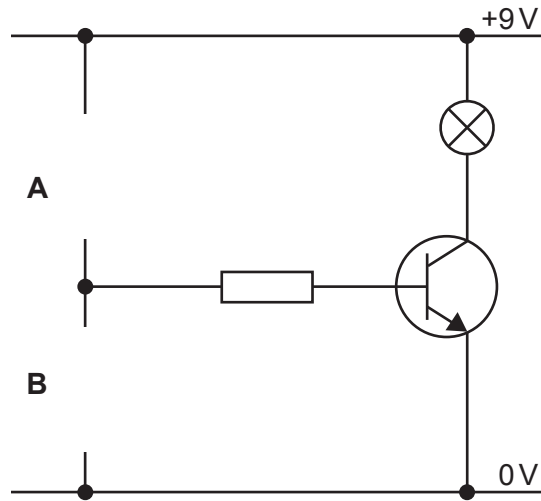
(a) Complete the circuit diagram in **Fig. 1** by adding the following:

- a variable resistor at position **A**

- a light dependent resistor (LDR) at position **B**. **[2]**

(b) Complete the table below by naming each of the components.

Component symbol	Name

[3]

(c) **Fig. 2** shows a motor connected to turn in a clockwise direction of rotation.

Fig. 2

Complete **Fig. 3** to show the motor running in the reverse direction.

Fig. 3

[2]

(d) Explain what is meant by the term 'rating of resistors'.

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.... **[3]**

Turn over

2 (a) Name each type of logic gate shown in **Fig. 4**.

Fig. 4

....
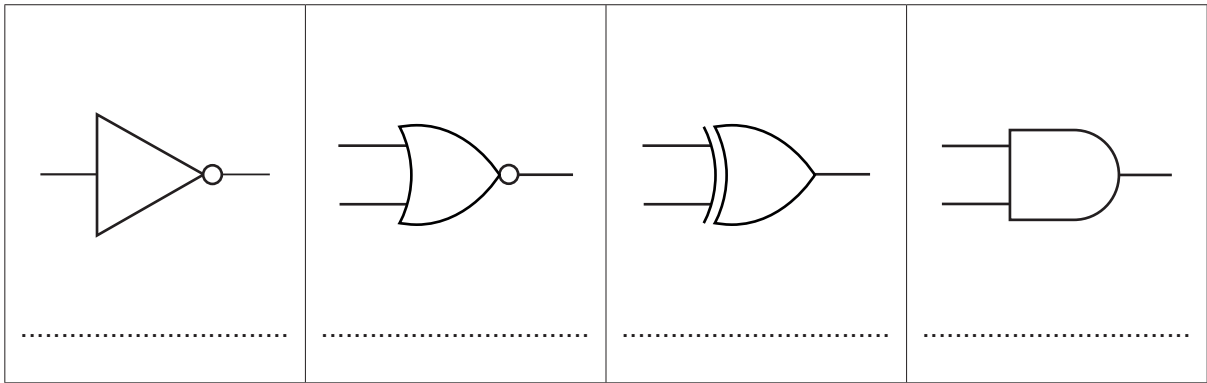
[4]

(b) Fig. 5 shows three signals that are part of the operation of a bistable circuit.

State the purpose of each signal in the operation of the bistable.

Fig. 5

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[3]

(c) The time constant (**T**) in a monostable circuit is given by **T** = 1.1 **RC**.

T is in seconds, **R** is in ohms and **C** is in farads.

Calculate the time constant (**T**) in seconds when **R** = 50 kΩ and **C** = 10 μF.

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.... [3]

3 A multimeter is set to measure resistance.

(a) Describe how you would use the multimeter to test whether a resistor is in good working order or is faulty.

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.... **[4]**

(b) Explain how a residual current device (RCD) operates.

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.... **[4]**

(c) **Fig. 6** shows two different types of cable used in electronics.

Name each type of cable.

Fig. 6

Cable **A**

Cable **B**

Cable **A** ....

Cable **B** ....

[2]

4 **(a)** Automatic testing of commercially produced printed circuit boards (PCBs) for quality assurance can be carried out using optical equipment.

   (i) Describe what happens during such an automatic test.

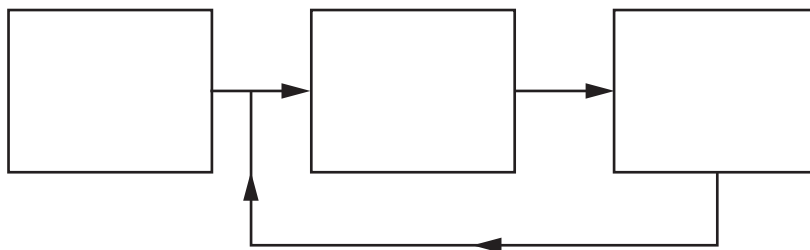   ....

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   .... **[4]**

   (ii) State **two** types of fault that a technician might find when visually inspecting a completed printed circuit board (PCB).

   1 ....

   2 ....

   [2]

(b) **Fig. 7** shows the outline of a control system.

Add labels to **Fig. 7** to show input, output, feedback and process.

Fig. 7

[4]

5 **(a)** Calculate the current taken by a lamp of resistance 46 Ω when connected to a 230 V supply.

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.... **[4]**

(b) Calculate the power absorbed by a solenoid of resistance 0.75 Ω carrying a current of 4 A.

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.... **[4]**

(c) State the units in which the following electrical quantities are measured:

Induction ....

Capacitance ....

[2]

Turn over

6 (a)* Discuss the function and applications of a voltage regulator in power supply circuits.

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.... **[6]**

(b) Complete the table by identifying which components are input devices and which are output devices.

Component	Type of device – input **or** output
Light Emitting Diode (LED)	
NTC Thermistor	
Photodiode	
Relay	

[4]

END OF QUESTION PAPER

10

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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