Modified Enlarged 24pt

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

Tuesday 10 January 2023 – Afternoon

Level 1/2 Cambridge National in Systems Control in Engineering

R113/01 Electronic principles

Time allowed: 1 hour
plus your additional time allowance

YOU MUST HAVE:
a scientific or graphical calculator

Please write clearly in black ink.

Centre number | | | | | |

Candidate number | | | | |

First name(s) _____

Last name _____

READ INSTRUCTIONS OVERLEAF

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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 (*).

ADVICE

Read each question carefully before you start your answer.

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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. [1]

FIG. 2

Double Pole Double

_____

(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). [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

(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. [5]

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					

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. [2]

	12	15	18	22	27	33		47	56	68	82

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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