OCR
Oxford Cambridge and RSA

Thursday 10 January 2019 – Afternoon

LEVEL 1/2 CAMBRIDGE NATIONAL IN SYSTEMS CONTROL IN ENGINEERING

R113/01 Electronic principles

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	

Centre number					Candidate number				

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 **12** pages. Any blank pages are indicated.

A calculator may be used for this paper

OCR is an exempt Charity

Turn over

2
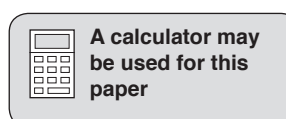
Answer **all** questions.

1 **(a)** Draw lines to connect each quantity to the correct unit.
The first one has been done for you.

Quantity	Unit
Current	hertz (Hz)
Electromotive force	henry (H)
Frequency	amp (A)
Capacitance	volt (V)
Induction	farad (F)

[4]

(b) Calculate the total resistance in ohms, of $4\,\Omega$ and $6\,\Omega$ resistors, connected in series.

....

.... **[2]**

(c) A potential difference of 6 V is applied across the terminals of a $300\,\Omega$ resistor.

Calculate the current, in amps, flowing through the resistor.

....

.... **[2]**

(d) Calculate the energy use in kilowatt hours when a 500 W heater is in use for **two** hours. State the units in your answer.

....

.... **[2]**

2 Fig. 1 shows a circuit diagram.
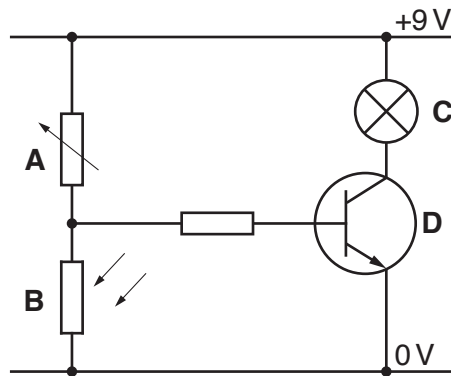
Fig. 1

(a) Complete the table below by naming each component from its symbol shown in Fig. 1.

Symbol	Component
A	
B	
C	
D	

[4]

(b) Explain why a fuse would be connected in the circuit shown in Fig. 1.

....

....

.... [2]

4

(c) Fig. 2 shows a potential divider circuit.
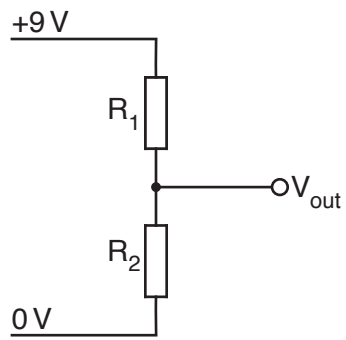
Fig. 2

Calculate the output voltage V_{out} when $R_1 = 30\,k\Omega$ and $R_2 = 20\,k\Omega$.

....

....

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.... **[4]**

5

3   (a) State **three** benefits of using a virtual oscilloscope for testing a simulated circuit.

1 ....

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2 ....

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3 ....

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                                                                                                                                [3]

(b) Fig. 3 shows a virtual oscilloscope being used to display a signal from a signal generator. The signal properties can be changed in the signal generator properties window.
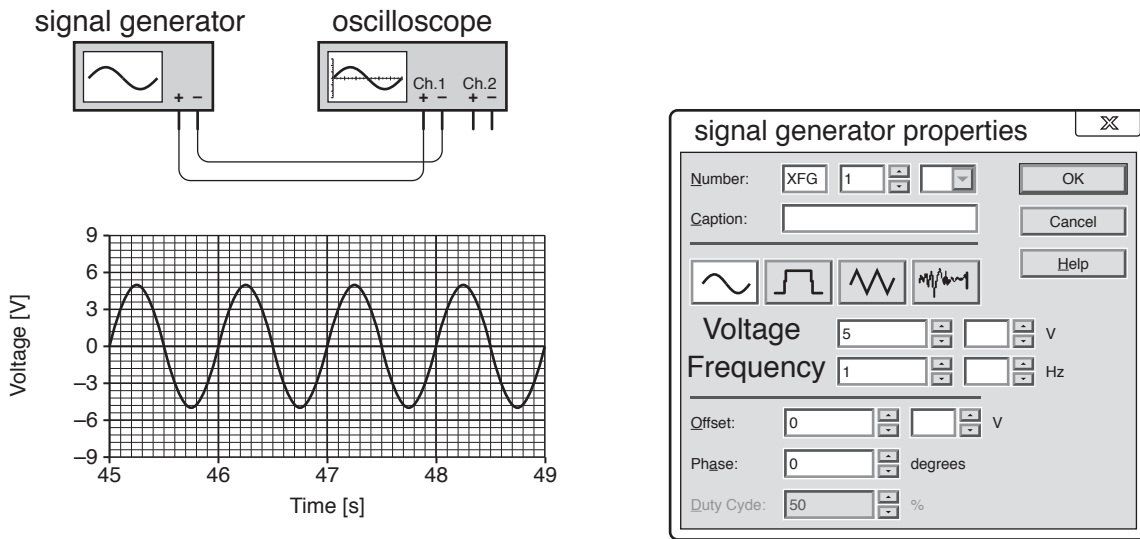

Fig. 3

Explain what happens to the signal when the following oscilloscope controls are adjusted in signal generator properties.

(i)   Voltage

....

....

.... **[2]**

(ii) Frequency

....

....

.... **[2]**

(c) Fig. 4 shows a waveform from the virtual oscilloscope with a dimension added.
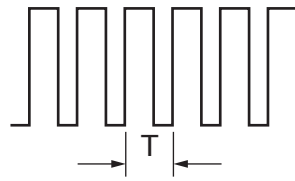
Fig. 4

(i) State the name of the type of signal that would produce the waveform shown in Fig. 4.

.... **[1]**

(ii) Describe how the value of 'T' is used to calculate the frequency of the signal.

....

....

.... **[2]**

4 (a) Complete the table using a tick (✓) to identify the **three** process devices.

Device	(✓)
Diode	
Pressure switch	
Operational amplifier	
Touch screen	
OR gate	
LED 7 segment display	

[3]

(b) Fig. 5 shows a logic circuit made from two logic gates.
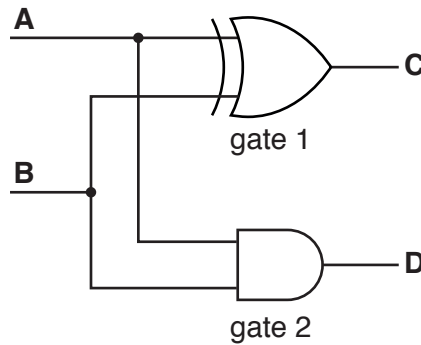
Fig. 5

(i) Name the **two** logic gates that are shown in Fig. 5.

gate 1 ....

gate 2 ....

[2]

(ii) Complete the truth table for the circuit in Fig. 5.

A	B	C	D
0	0		
0	1		
1	0		
1	1		

[2]

Turn over

8

(c) Fig. 6 shows the pin arrangement for a 4017 single digit decade counter IC.
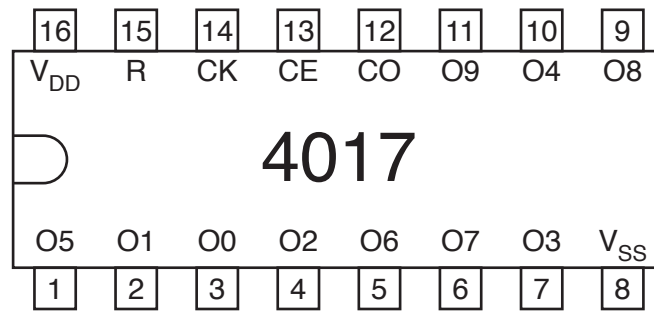

Fig. 6

Pins 1 to 7 and 9 to 11 are outputs for the counter, pin 14 is the clock pin and pin 15 is the reset pin.

State the purpose of pins 8, 14 and 15.

Pin 8 ....

Pin 14 ....

Pin 15 ....

[3]

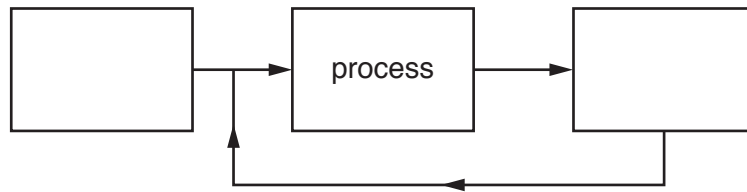**5** Fig. 7 shows a block diagram of a control system.

Fig. 7

(a) Label Fig. 7 with the terms; 'input', 'feedback' and 'output'. **[3]**

(b) State the name of **three** manufacturing processes that are used to construct commercial printed circuit boards.
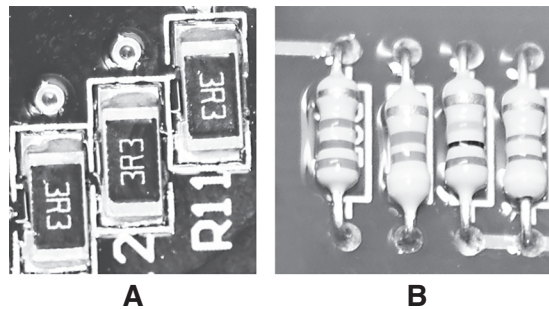
1 ....

2 ....

3 ....

[3]

(c) Fig. 8 shows two methods for commercial circuit construction of a circuit board.

Fig. 8

State the type of commercial circuit construction that is being shown at:

A ....

B ....

[2]

(d) State the name of **two** quality assurance methods that are used during commercial printed circuit board (PCB) production.

1 ....

2 ....

[2]

6 **(a)*** Discuss the function and applications of a reed switch and a micro switch in electronic circuits.

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.... **[6]**

(b) Calculate the time constant for a switching circuit when a $400\,\mu F$ capacitor is connected in series with an $800\,\Omega$ resistor across a $230\,V$ supply.

Use the formula T=RC. State the units in your answer.

....

....

....

....

.... **[4]**

END OF QUESTION PAPER

11

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).