

Monday 1 June 2015 – Afternoon

**LEVEL 1/2 CAMBRIDGE NATIONAL IN SYSTEMS CONTROL
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	
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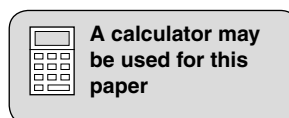
Centre number						Candidate number				
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INSTRUCTIONS TO CANDIDATES

- 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.
- Do **not** write in the bar codes.

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.
- This document consists of **16** pages. Any blank pages are indicated.
- Quality of written communication will be assessed in questions marked with an asterisk (*).



Answer **all** the questions.

1 (a) Fig. 1 shows part of a circuit diagram.

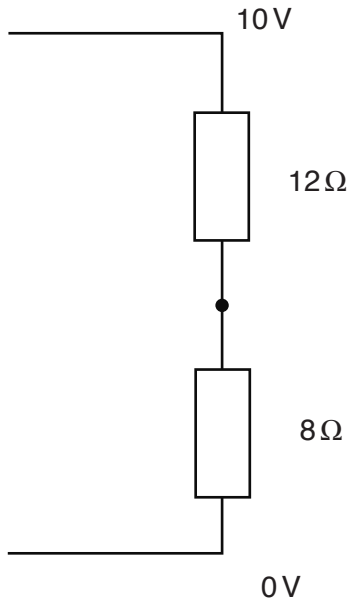


Fig. 1

(i) State whether the resistors are connected in series or in parallel.

..... [1]

(ii) Give the total resistance of this part of the circuit.

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

(iii) Calculate the current flowing through the two resistors.

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

(iv) Calculate the potential difference across the 8Ω resistor.

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

- (b) (i) On Fig. 1 show how you would connect a voltmeter to measure the supply voltage. [1]
- (ii) Write down the colours that would be used for the $12\Omega \pm 5\%$ resistor, using the information from the table:

Digit 1	Digit 2	Multiplier	Tolerance
Black 0	Black 0	Black 0	
Brown 1	Brown 1	Brown 1	Brown 1%
Red 2	Red 2	Red 2	Red 2%
Orange 3	Orange 3	Orange 3	Gold 5%

The resistor colours are:

Digit 1

Digit 2

Multiplier

[1]

State the maximum value of a resistor that could be expected in a batch of 12Ω resistors.

..... [1]

2 (a) Fig. 2 shows a circuit diagram.

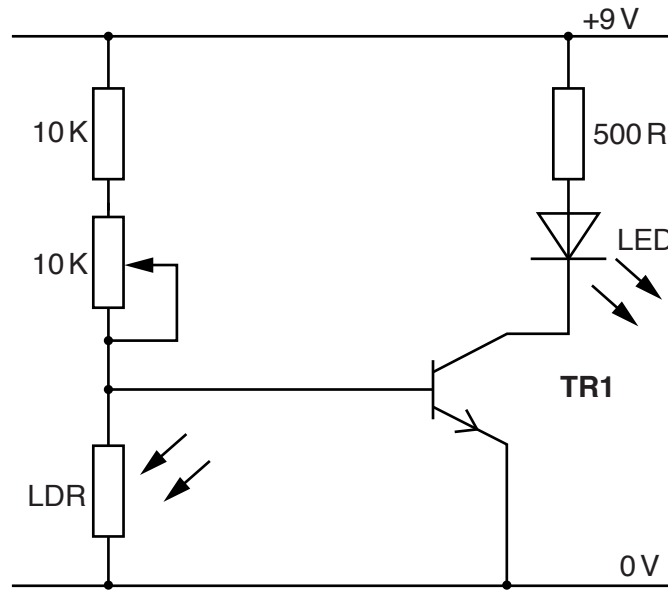


Fig. 2

- (i) Give the meaning of the letters LDR.
 [1]
- (ii) State the function of the LDR in the circuit.

 [1]
- (iii) Give the meaning of the letters LED.
 [1]
- (iv) State **one** function of the transistor **TR1** in the circuit.

 [1]

(v) Calculate the current flowing through the 500R resistor if the forward voltage of the LED is 1V.

Assume there is no voltage drop across the transistor.

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

(b) Give **three** practical applications of an LED.

1
.....
2
.....
3
..... [3]

- 3 (a) (i) For a control system, explain what is meant by the term 'input'.

.....

.....

.....

..... [2]

- (ii) Draw a labelled block diagram for a closed loop system.

[2]

- (iii) Complete the table with a tick (✓) to identify which **three** devices are used as output devices.

Device	Output
Liquid Crystal Display (LCD)	
NTC Thermistor	
Pressure switch	
Piezoelectric buzzer	
Phototransistor	
Solenoid	

[3]

(b) (i) Draw the symbol for an operational amplifier (op amp).

[1]

(ii) Explain the function of an op amp as a process device.

.....

.....

.....

..... [2]

4 (a) Fig. 3 shows a multimeter being used to measure voltage across a motor.

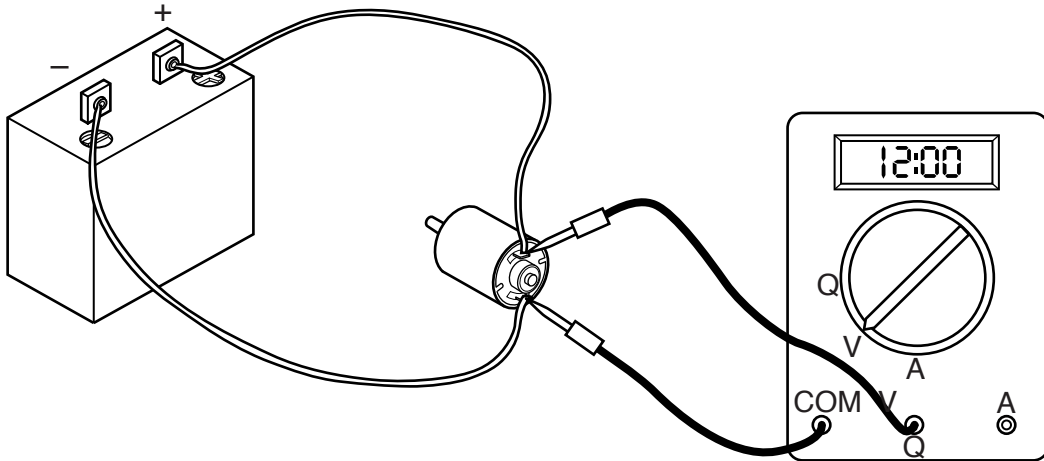


Fig. 3

Describe the changes needed to enable the multimeter to measure current flowing through the motor.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

5 (a) Describe the process of using a soldering iron to solder a component on a printed circuit board (PCB).

.....
.....
.....
.....
.....
.....
..... [4]

(b) Explain why it is necessary to use a PCB eraser.

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

(c) State **two** methods of assuring the quality of tracks on a PCB.

1
2 [2]

(d) Give **two** safety precautions that should be taken when using a soldering iron.

1
.....
.....
2
.....
..... [2]

6 (a) Name the logic gate shown in Fig. 4.

(i) [1]



Fig. 4

(ii) Add labels for input **A**, input **B** and output **C** to the logic gate in Fig. 4. [1]

(iii) Complete the truth table shown below.

Input A	Input B	Output C
0	0	
0	1	
1	0	
1	1	

[1]

(b) Fig. 5 shows a digital circuit made up of logic gates.

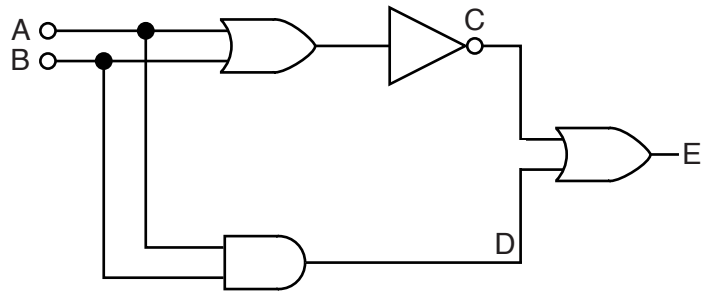


Fig. 5

Complete the truth table for the circuit shown in Fig. 5.

Input A	Input B	Input C	Input D	Output E
0	0			
0	1			
1	0			
1	1			

[3]

(c) Fig. 6 shows an SR bistable circuit.

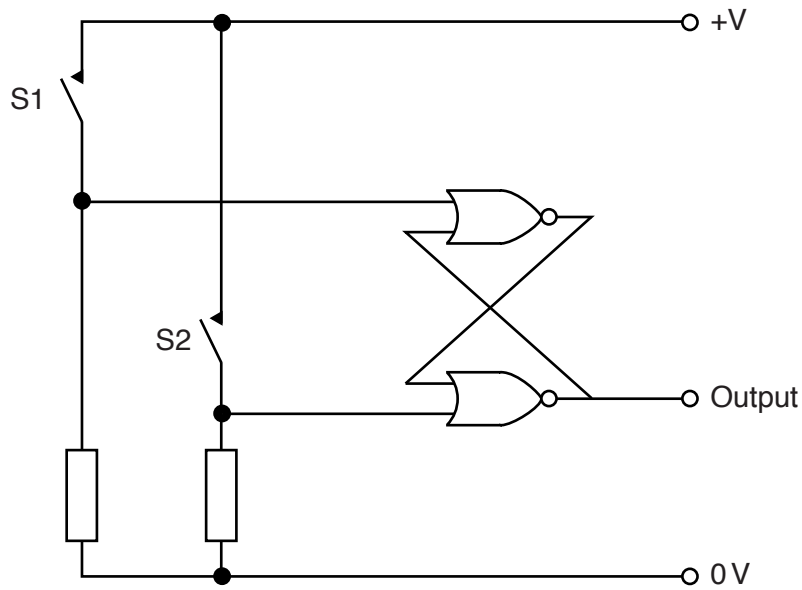


Fig. 6

(i) State what is meant by a 'bistable circuit'.

.....
 [1]

(ii) Give the logic level at the output when the circuit is first switched on.

..... [1]

(iii) State the logic level at the output when the switch S1 is closed and held down.

..... [1]

(iv) State the logic level at the output when the switch S1 is released.

..... [1]

END OF QUESTION PAPER

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