OCR
Oxford Cambridge and RSA

Monday 6 June 2016 – 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. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

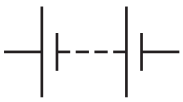
INFORMATION FOR CANDIDATES

- 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.
- 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

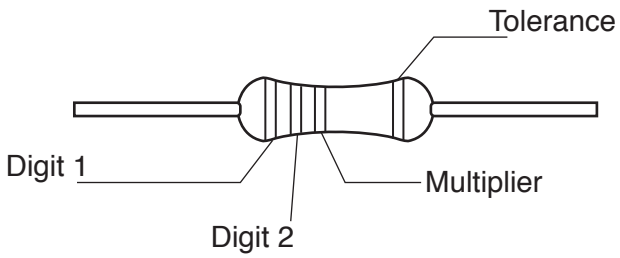
Answer **all** the questions.

1 **(a)** Complete the table by naming each component from its symbol.

Symbol	Component
	
	
	
	

[4]

(b) Fig. 1 shows a fixed resistor and a resistor colour code chart.



Digit 1		Digit 2		Multiplier		Tolerance	
black	0	black	0	black	0	brown	0.01
brown	1	brown	1	brown	1	red	0.02
red	2	red	2	red	2	gold	0.05
orange	3	orange	3	orange	3		
yellow	4	yellow	4	yellow	4		
green	5	green	5	green	5		
blue	6	blue	6	blue	6		
violet	7	violet	7	gold	0.1		
grey	8	grey	8	silver	0.01		
white	9	white	9				

Fig. 1

Use the resistor colour code chart to determine the band colours of a resistor of value 24 kΩ ± 5%.

Digit 1 .....

Digit 2 .....

Multiplier .....

Tolerance .....

[2]

(c) Determine the total resistance of three resistors, with values of 10 Ω, 6.8 Ω and 8.2 Ω, that are connected in series.

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

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

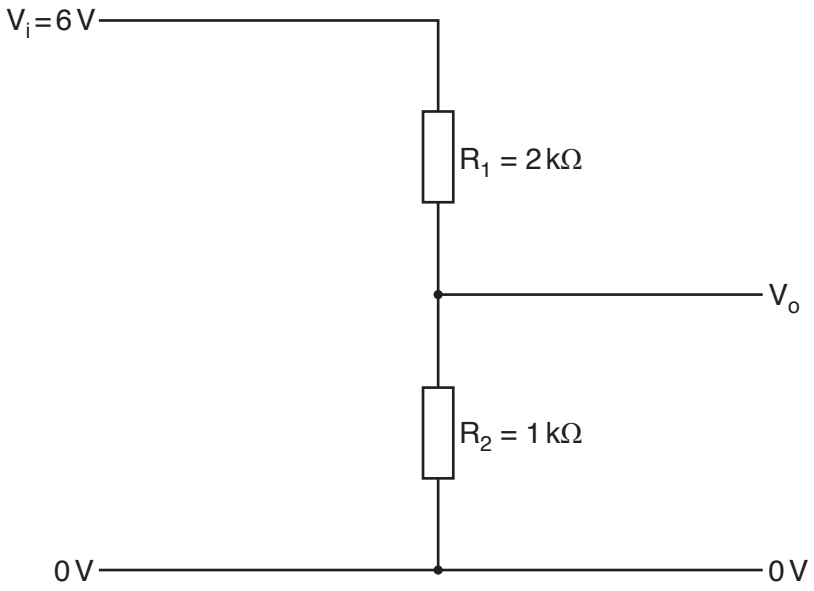

Fig. 2

Calculate the output voltage V_o.

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

2 Fig. 3 shows part of a circuit diagram using a two-transistor combination.

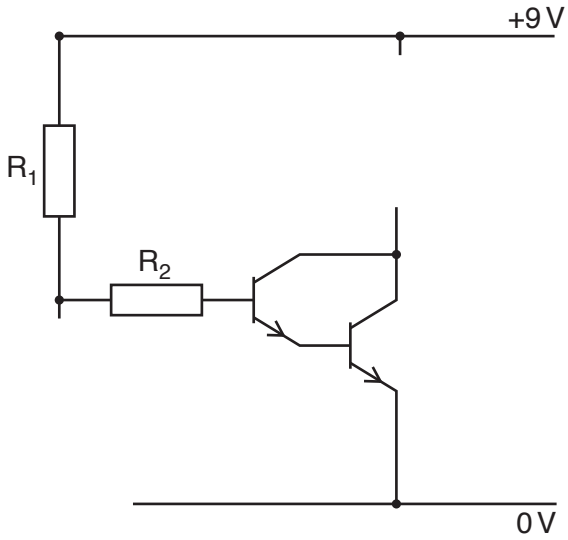

Fig. 3

(a) Complete the circuit diagram in **Fig. 3** using a light dependent resistor (LDR) as an input transducer and a signal lamp as an output transducer. **[2]**

(b) Name the **two** components that form a Darlington pair.

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

(c) Explain in detail how the circuit works.

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..... **[5]**

(d) State what would happen to the signal lamp if resistor R_1 was increased in value.

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

(e) State what happens to the signal lamp when a 1000 μF capacitor is connected across the LDR before testing the circuit in darkness.

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

3 Fig. 4 shows an operational amplifier (op amp).

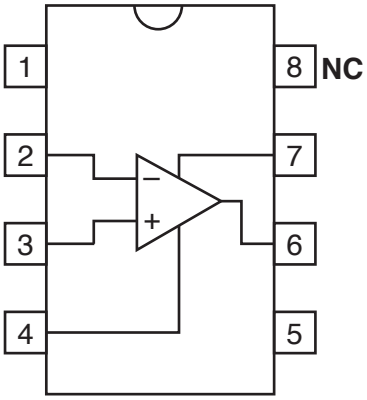

Fig. 4

(a) On Fig. 4, label the terminals 2, 3, 4, 6 and 7 with the following terms:

Supply $+V_{cc}$
Supply $-V_{cc}$
Output
Non-inverting input
Inverting input. **[5]**

(b) State what is meant by **NC** on terminal 8.

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

(c) Describe with the aid of a labelled diagram, the use of the operational amplifier as a comparator.

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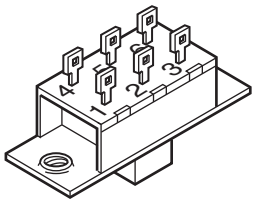
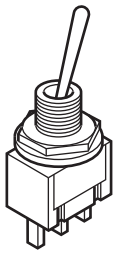
..... **[5]**

4 Fig. 5 shows **two** types of switch.



Switch **A**



Switch **B**

Fig. 5

(a) From the list below name each type of switch.

Double Pole Single Throw
Double Pole Double Throw
Micro
Toggle

Switch **A** .....

Switch **B** .....

[2]

(b) Draw the graphical symbol of a reed switch.

[1]

(c) State which **two** of the following are output devices:

Buzzer
Microphone
Solenoid
Photodiode.

1 .....

2 .....

[2]

(d) Fig. 6 shows an electromechanical relay, which is an output device.

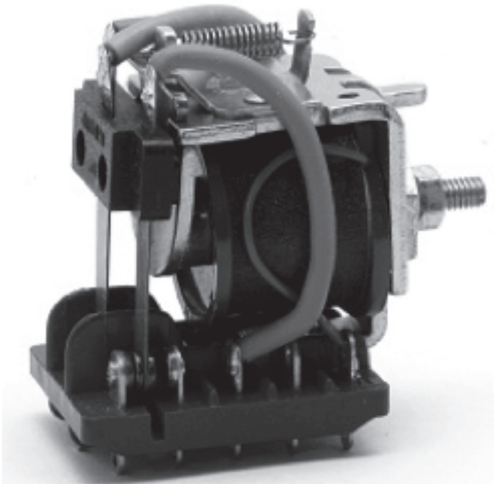


Fig. 6

Describe how an electromechanical relay works.

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..... **[5]**

5 **(a)** Explain what is meant by the term 'portable appliance testing' (PAT).

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

(b) Name **three** PAT tests that are carried out on a portable electrical appliance.

1 .....

2 .....

3 .....

[3]

(c) Fig. 7 shows a 13A plug with its cover removed.

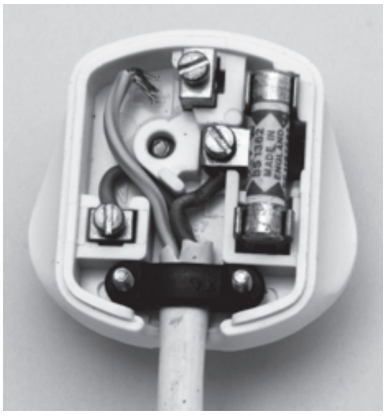

Fig. 7

Explain why this plug should not be connected to an electrical supply.

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

(d) A label is attached to an appliance to show it has passed a portable appliance test (PAT). One item of information included on the label is the date of the test.

Name **two** other pieces of information that would be included on the label.

1 .....

2 .....

[2]

6 **(a)** Describe how the flow (wave) solder process is carried out.

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

(b)* Discuss the advantages to a manufacturer of using pick and place robots for surface mount components rather than using manual component placement.

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..... **[6]**

END OF QUESTION PAPER

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