

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
LEVEL 1/2**

R113/01

**CAMBRIDGE NATIONAL IN SYSTEMS
CONTROL IN ENGINEERING**

Electronic principles

MONDAY 6 JUNE 2016: Afternoon

**DURATION: 1 hour
plus your additional time allowance**

MODIFIED ENLARGED

Candidate forename						Candidate surname				
Centre number						Candidate number				

Candidates answer on the Question Paper.

OCR SUPPLIED MATERIALS:
None

OTHER MATERIALS REQUIRED:
A calculator may be used

A CALCULATOR MAY BE USED FOR THIS PAPER
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READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

Use black ink. HB pencil may be used for graphs and diagrams only.

Complete the boxes on the first page 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).

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.

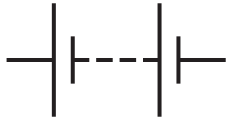



Quality of written communication will be assessed in questions marked with an asterisk (*).

Any blank pages are indicated.

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Answer ALL the questions.

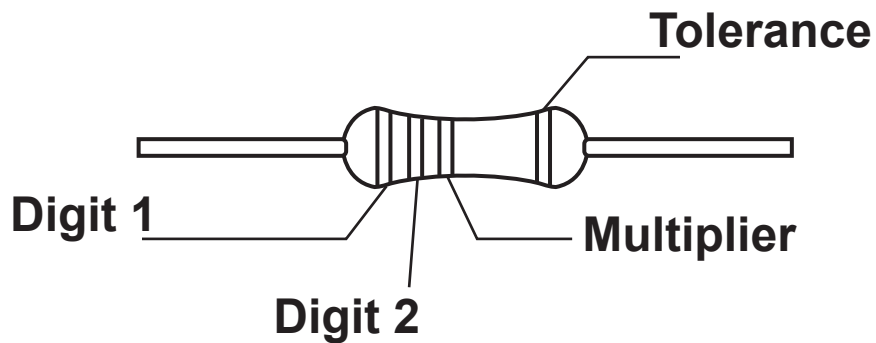
- 1 (a) Complete the table by naming each component from its symbol. [4]**

Symbol	Component
	
	
	
	

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

Fig. 1



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		

Use the resistor colour code chart to determine the band colours of a resistor of value $24\text{ k}\Omega \pm 5\%$.

Digit 1 _____

Digit 2 _____

Multiplier _____

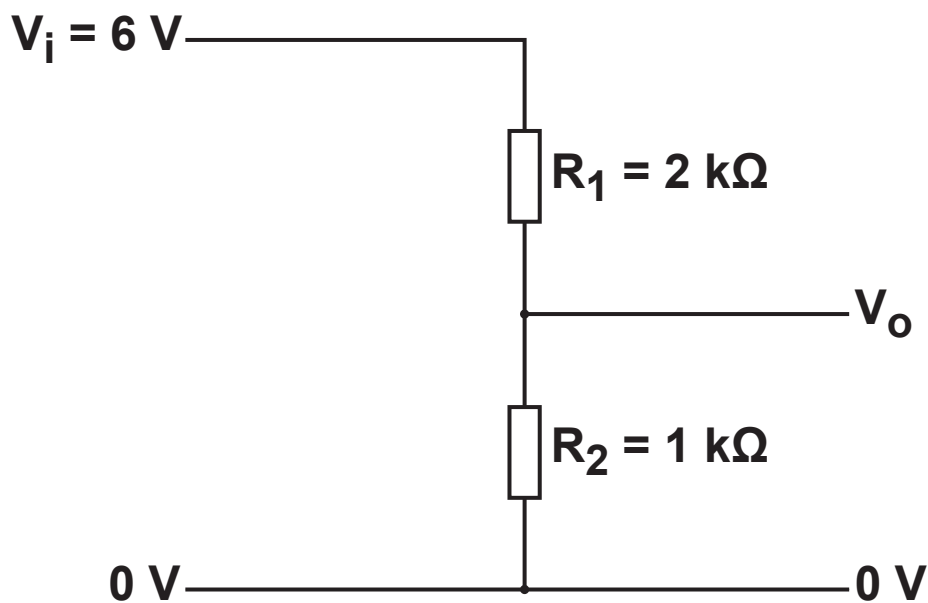
Tolerance _____ [2]

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

[1]

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

Fig. 2



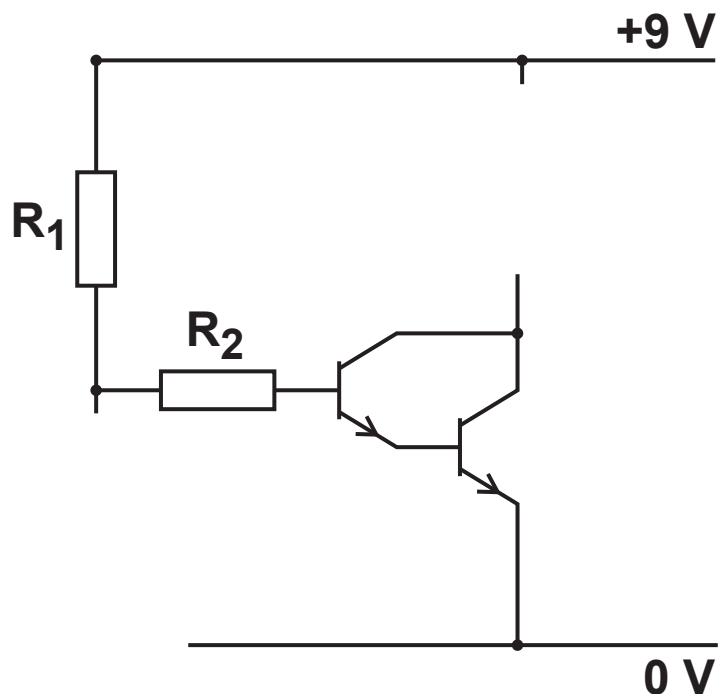
Calculate the output voltage V_o .

[3]

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- 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.

[5]

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

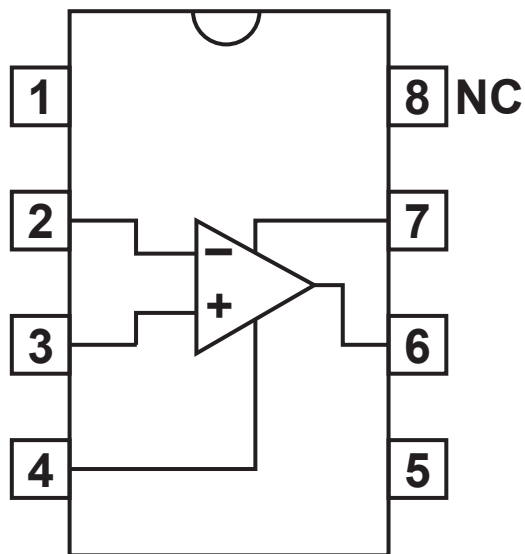
[1]

(e) State what happens to the signal lamp when a $1000\mu\text{F}$ capacitor is connected across the LDR before testing the circuit in darkness.

[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]

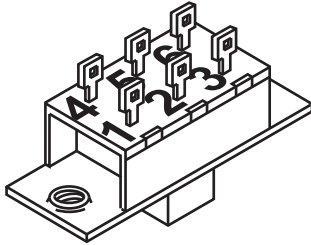
(c) Describe with the aid of a labelled diagram, the use of the operational amplifier as a comparator.

[5]

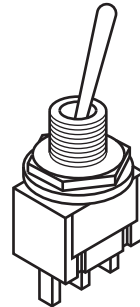
4 Fig. 5 shows TWO types of switch.

Fig. 5

Switch A



Switch B



(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.

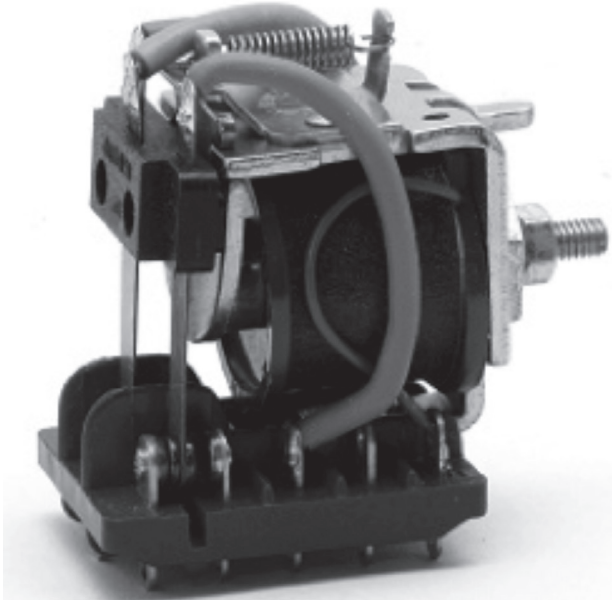
1 _____

2 _____

[2]

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

Fig. 6



Describe how an electromechanical relay works.

[5]

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

_____ **[2]**

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

1 _____

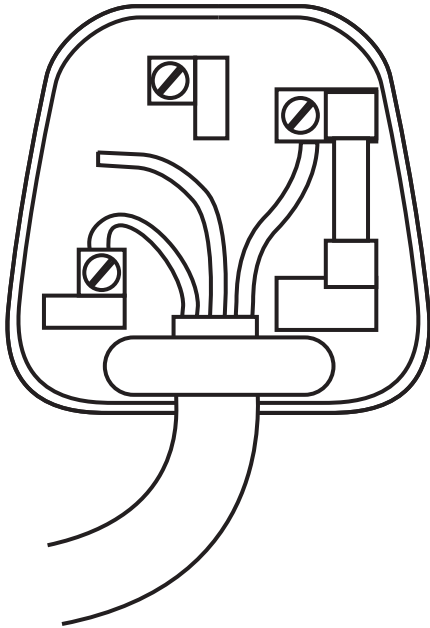
2 _____

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.

[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]

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

[4]

(b)* Discuss the advantages to a manufacturer of using pick and place robots for surface mount components rather than using manual component placement. [6]

[illegible]

END OF QUESTION PAPER



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