

Candidate Name	Centre Number	Candidate Number
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**GCSE**

293/01

**ELECTRONICS**

**MODULE TEST E1**

**FOUNDATION TIER**

P.M. FRIDAY, 23 May 2008

45 minutes

<b>For Examiner's use only</b>	
<b>Total Mark</b>	

**ADDITIONAL MATERIALS**

In addition to this examination paper you may need a calculator.

**INSTRUCTIONS TO CANDIDATES**

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided in this booklet.

**INFORMATION FOR CANDIDATES**

The number of marks is given in brackets at the end of each question or part-question.

## INFORMATION SHEET

This information may be of use in answering the questions.

### 1. Resistor Colour Codes

<b>BLACK</b>	<b>0</b>	<b>GREEN</b>	<b>5</b>
<b>BROWN</b>	<b>1</b>	<b>BLUE</b>	<b>6</b>
<b>RED</b>	<b>2</b>	<b>VIOLET</b>	<b>7</b>
<b>ORANGE</b>	<b>3</b>	<b>GREY</b>	<b>8</b>
<b>YELLOW</b>	<b>4</b>	<b>WHITE</b>	<b>9</b>

The fourth band colour gives the tolerance as follows:

**GOLD**  $\pm$  5%

**SILVER**  $\pm$  10%

### 2. Preferred Values for Resistors

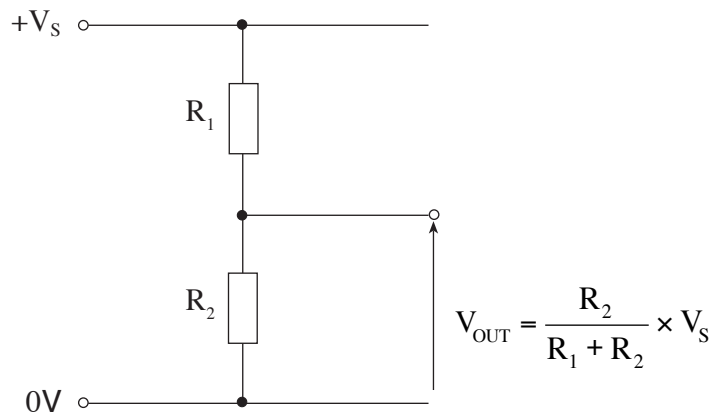
#### E 12 SERIES OF PREFERRED VALUES

10; 12; 15; 18; 22; 27; 33; 39; 47; 56; 68; 82 and multiples thereafter

3. Resistance =  $\frac{\text{voltage}}{\text{current}}$  ;  $R = \frac{V}{I}$  .

4. Effective resistance, R, of two resistors  $R_1$  and  $R_2$  in series is given by  $R = R_1 + R_2$ .

### 5. Voltage Divider



6. Power = voltage  $\times$  current;  $P = VI$

7. LED The forward voltage drop across a LED is 2V.

### 8. Transistors

The forward voltage drop across the base emitter junction is 0.7V.

Answer **all** questions in the spaces provided.

1. Electronic subsystems can be classed as either *input*, *process* or *output* subsystems. For example, a transducer driver is a **process** subsystem.

Here are five subsystems:

*latch      lamp unit      AND gate      switch unit      solenoid unit*

Add the name of each subsystem to the correct column of the table.

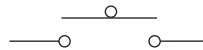
[3]

Input	Process	Output
	<i>Transducer driver</i>	

2. Here is a list of electronic components:

*push switch      diode      thermistor      LED*

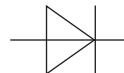
- (a) Which component has this symbol?



Answer .....

[1]

- (b) Which component has this symbol?



Answer .....

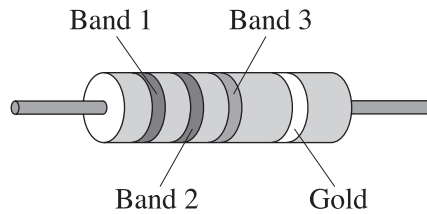
[1]

- (c) Which component would you use to sense temperature changes?

Answer .....

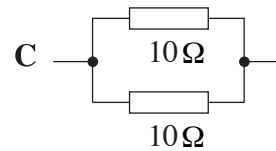
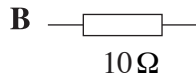
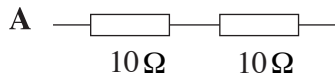
[1]

3. (a) How many milliamps are there in 1 amp? ..... [1]  
 (b) How many ohms are there in 1 megohm? ..... [1]  
 (c) The diagram shows a 4.7kΩ resistor.

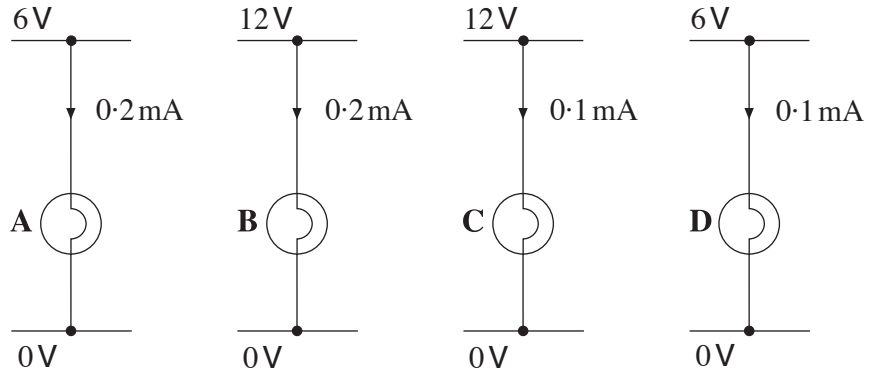


- (i) Change 4.7kΩ into ohms. [1]  
 .....  
 (ii) Use the resistor colour code to select the colours of: [3]  
 Band 1 ..... Band 2 ..... Band 3 .....

- (d) Which of the following, **A**, **B** or **C** has the smallest resistance? ..... [1]



4. Here are four circuits.



(a) What is the power used in lamp **A**? [1]

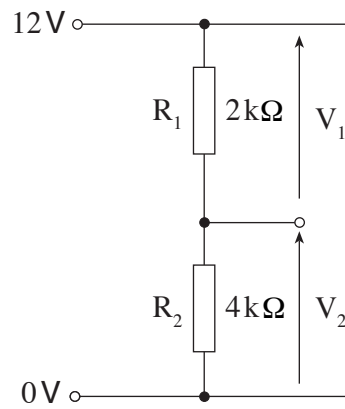
Choose your answer from the following list:

- 0.3 mW*    *1.2 mW*    *2.4 mW*    *30 mW*

Answer .....

(b) Which lamp, **A**, **B**, **C** or **D**, will use the most power? ..... [1]

5. The circuit diagram below shows a voltage divider.

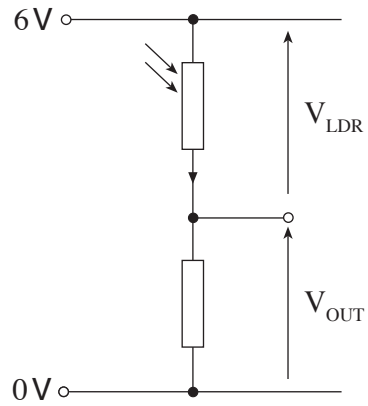


- (a) Which voltage will be bigger,  $V_1$  or  $V_2$ ? ..... [1]
- (b) When you add together the voltages  $V_1$  and  $V_2$ , what is the total? ..... [1]
- (c) What is the combined resistance of  $R_1$  and  $R_2$ ? ..... [1]
- (d) Calculate voltage  $V_2$ .  
*Hint: The equation is given on page 2.* [2]

.....

.....

6. Here is the circuit diagram for a light-sensing unit.



A bright light is now shone on the LDR.  
As a result, what happens to:

(a) the resistance of the LDR? [1]

.....

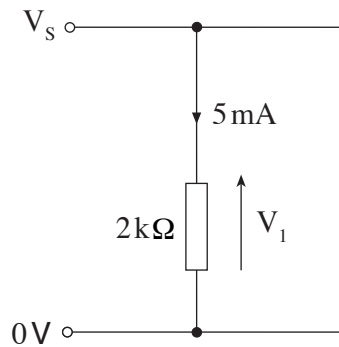
(b) the voltage  $V_{LDR}$  across the LDR? [1]

.....

(c) the output voltage  $V_{OUT}$ ? [1]

.....

7. In the diagram, the  $2\text{k}\Omega$  resistor has a current of  $5\text{ mA}$  flowing into it.



Calculate the voltage  $V_1$  across the  $2\text{k}\Omega$  resistor.

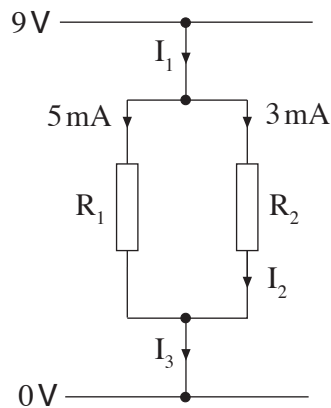
[2]

*Hint: The equation is given on page 2.*

.....

.....

8.



(a) Write down the value of current  $I_2$ .

..... [1]

(b) Calculate current  $I_3$ .

[1]

.....

(c) Which is the bigger resistor,  $R_1$  or  $R_2$ ? .....

Give a reason for your choice.

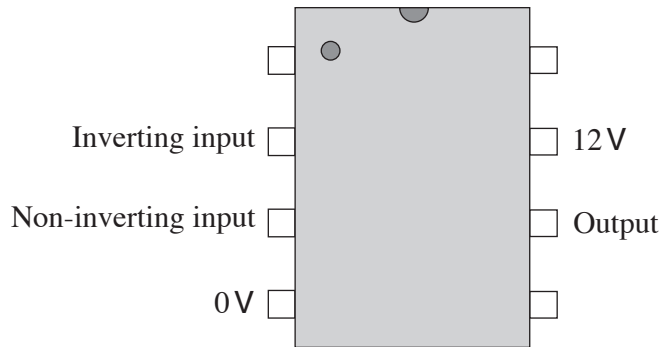
[1]

.....

.....



9. The diagram shows the pinout for a comparator IC.



(a) What is the pin number of:

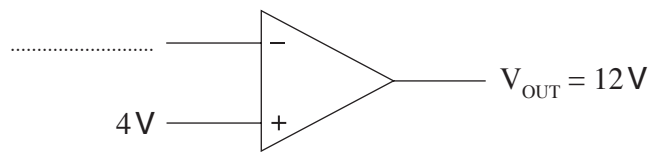
(i) the inverting input? ..... [1]

(ii) the output? ..... [1]

(b) The comparator output saturates at 12V and 0V.

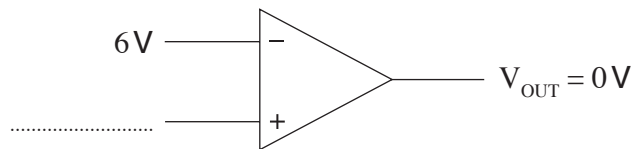
(i) The non-inverting input is set to 4V.

Write down a voltage at the inverting input that will make the output voltage 12V. [1]

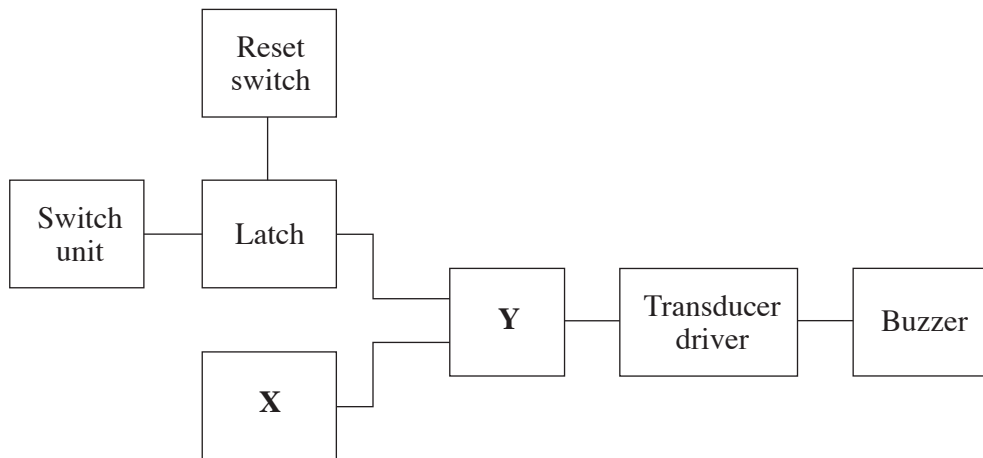


(ii) The inverting input is set to 6V.

Write down a voltage at the non-inverting input that will make the output voltage 0V. [1]



10. Here is the block diagram for a burglar alarm.



The alarm is triggered when a burglar stands on a pressure pad (the switch unit). The buzzer then beeps on and off repeatedly until the reset switch is pressed.

(a) What is the job of the latch in this system? [1]

.....

.....

.....

(b) Subsystem X causes the buzzer to beep on and off repeatedly.

What is the name for this subsystem?

Choose your answer from the following list of subsystems:

- OR gate      Comparator      AND gate      Delay unit      Pulse Generator*

Answer ..... [1]

(c) Subsystem Y combines the signals from subsystem X and the latch so that the buzzer pulses only when the latch is switched on.

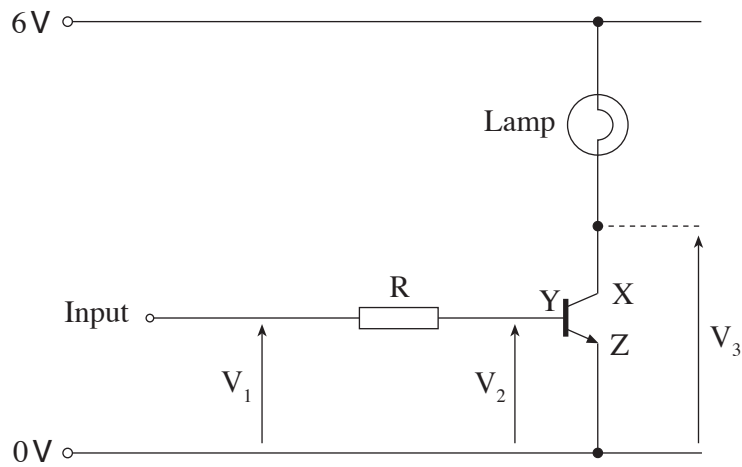
What is the name for this subsystem?

Choose your answer from the following list of subsystems:

- OR gate      Comparator      AND gate      Delay unit      Pulse Generator*

Answer ..... [1]

11. The circuit diagram shows a transistor switch used as a transducer driver.



(a) Which leg of the transistor, X, Y or Z, is the base? ..... [1]

(b) (i) The transistor is just saturated when the input voltage  $V_1$  is 2.0V. Complete the table by giving the voltage  $V_3$ , and the state of the bulb for the given values of input voltage  $V_1$ . [3]

Input voltage $V_1$	$V_3$	Bulb – On / Off?
0.2V		
2.0V		

(ii) What is the voltage  $V_2$  when the transistor is just saturated? ..... [1]