

# Digital electronics (extended candidates)

## Question Paper 4

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	Electricity and Magnetism
Sub-Topic	Digital electronics (extended candidates)
Paper Type	(Extended) Theory Paper
Booklet	Question Paper 4

**Time Allowed:** 51 minutes

**Score:** /42

**Percentage:** /100

1 Fig. 10.1 shows a circuit based on a transistor and a thermistor.

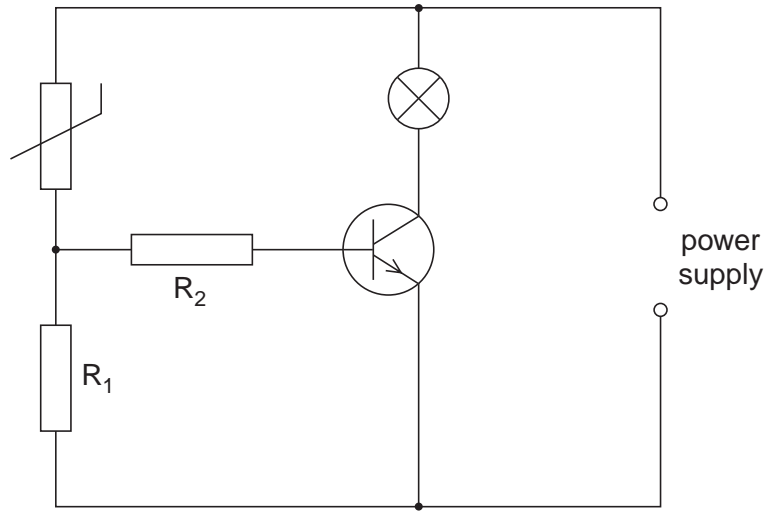


Fig. 10.1

(a) Describe the action of the thermistor in this circuit.

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

(b) State and explain how the circuit may be modified so that the lamp switches on at a different temperature.

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

(c) State one practical use of this circuit.

..... [1]

- 2 (a) Fig. 10.1 shows an AND gate with two inputs A and B and one output.



Fig. 10.1

State the output when

- (i) A is high and B is low,

..... [1]

- (ii) both A and B are low.

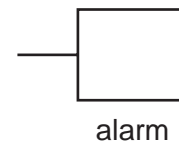
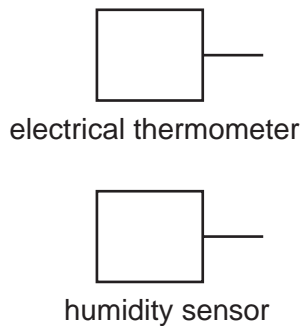
..... [1]

- (b) An electrical thermometer in a greenhouse gives a low output if the temperature is too low.

A humidity sensor in the same greenhouse gives a high output if the humidity in the greenhouse is too high.

An alarm sounds when both the temperature is too low and the humidity is too high.

- (i) Complete the diagram below to show how a NOT gate and an AND gate may be used to provide the required output to the alarm. [2]



- (ii) On your diagram, use either 'high' or 'low' to indicate the level of the inputs and outputs of both gates when the alarm sounds. [2]

[Total: 6]

- 3 Fig. 10.1 shows a circuit that is used to switch on a lamp automatically when it starts to go dark.

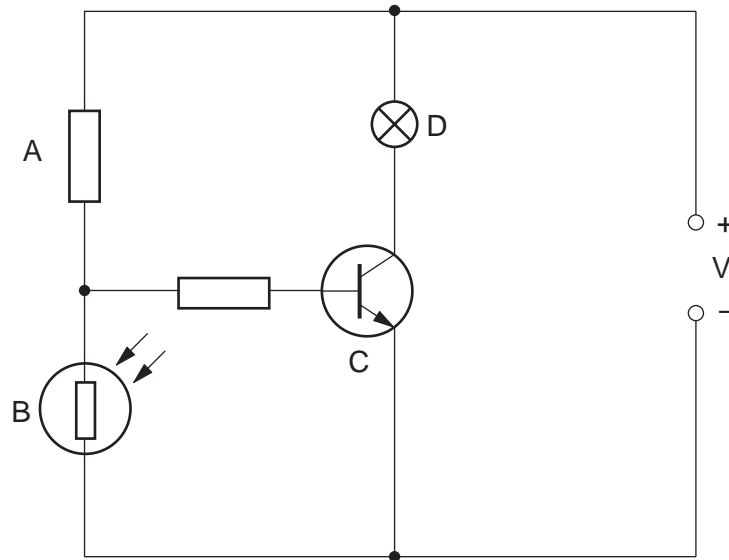


Fig. 10.1

- (a) Write down the names of the components labelled A, B, C and D.

A .....

B .....

C .....

D .....

[2]

- (b) Which of the four components A, B, C or D acts as a switch?

.....[1]

- (c) Explain why the lamp comes on as it goes dark.

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

4 (a) Fig. 9.1 shows an a.c. supply connected to a resistor and a diode.

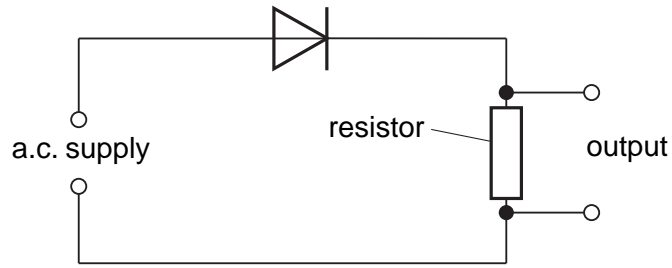


Fig. 9.1

(i) State the effect of fitting the diode in the circuit.

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

(ii) On Fig. 9.2, sketch graphs to show the variation of the a.c. supply voltage and the output voltage with time.

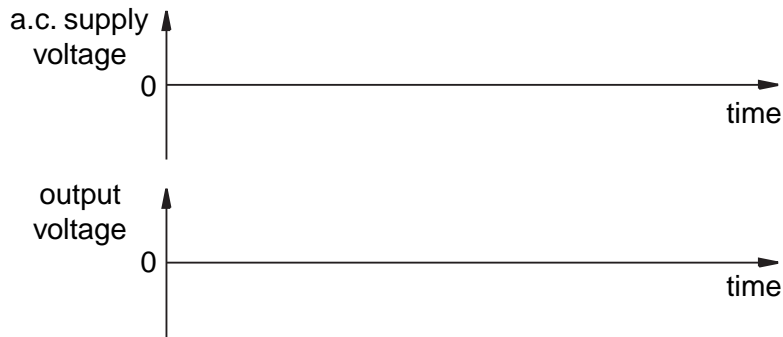


Fig. 9.2

[2]

(b) (i) In the space below, draw the symbol for a NOT gate.

[1]

(ii) State the action of a NOT gate.

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

5 (a) In the space provided, draw the symbol for a NOR gate. Label the inputs and the output.

[2]

(b) State whether the output of a NOR gate will be high (ON) or low (OFF) when

(i) one input is high and one input is low,

.....

(ii) both inputs are high.

.....

[1]

(c) Fig. 9.1 shows a digital circuit made from three NOT gates and one NAND gate.

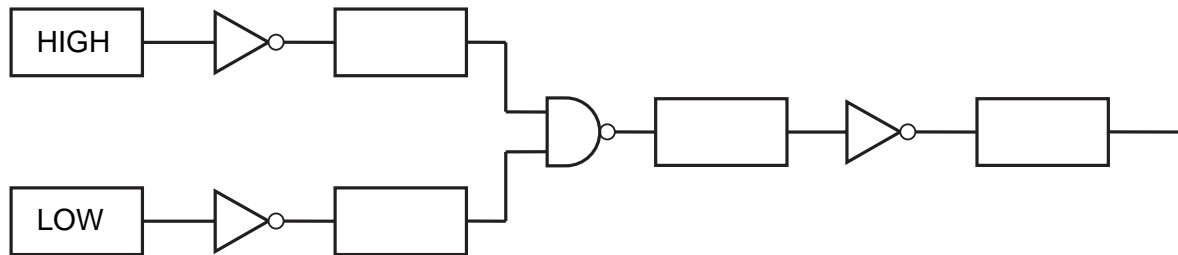


Fig. 9.1

(i) Write HIGH or LOW in each of the boxes on Fig. 9.1.

[2]

(ii) State the effect on the output of changing both of the inputs.

.....

..... [1]

[ Total : 6 ]

- 6 (a) Fig. 10.1 shows the faces of two ammeters. One has an analogue display and the other a digital display.

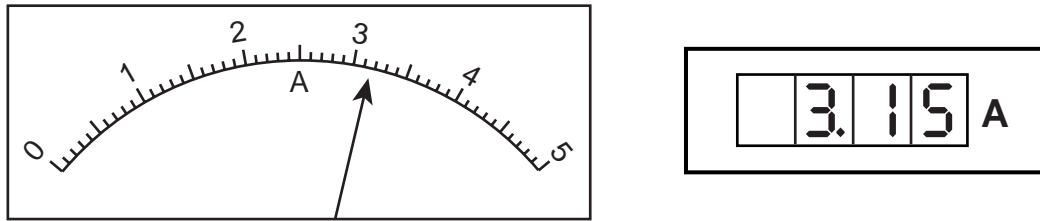


Fig. 10.1

State what is meant by the terms *analogue* and *digital*.

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

- (b) (i) Name the components from which logic gates are made.

.....[1]

- (ii) In the space below, draw the symbol for an AND gate.  
Label the inputs and the output.

[1]

- (iii) Describe the action of an AND gate with two inputs.

[2]

7 (a) (i) What is the function of a transistor when placed in an electrical circuit?

.....

(ii) Describe the action of a transistor.

.....

.....

.....

[3]

(b) (i) In the space below, draw the symbol for an OR gate. Label the inputs and the output.

[1]

(ii) Describe the action of an OR gate that has two inputs.

.....

.....

.....

[2]