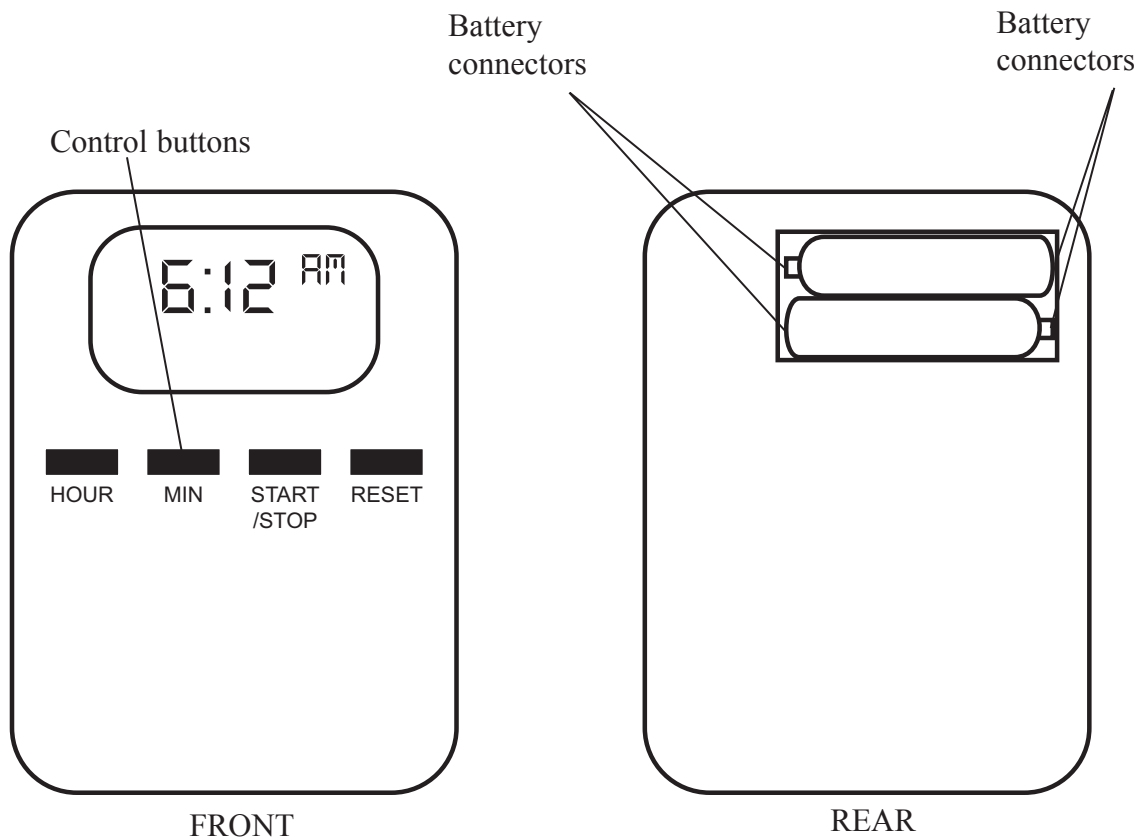


Answer ALL the questions. Write your answers in the spaces provided.

1. The diagrams below show a digital timer.



(a) Two specification points for the timer are that it must be:

- easy to adjust the timing settings
- easy to read the display.

Under each of the following headings, give **one** more point that should be included in the specification for the timer.

For each point, give **one** reason why it should be included.

Quality.

Point

Reason

(2)

Environment.

Point

Reason

(2)

Safety.

Point

Reason

(2)



(b) The timer uses a 7-segment display.

One reason why a 7-segment display is used is because it is readily available.

Give **two** other reasons why a 7-segment display is suitable for this timer.

1

2 (2)

(c) The casing of the timer is manufactured using the injection moulding process.

Give **two** reasons why injection moulding is a suitable process for the manufacture of the casing.

1

.....

2

..... (2)

(d) The casing is assembled using solvent cement.

Explain **one** reason why solvent cement is used for assembling the casing.

.....

.....

..... (2)



(e) The battery connectors are made from brass.

Give **two** properties of brass that make it a suitable material for the battery terminals.

For each property give **one** reason why brass is suitable.

Property 1

Reason

.....

Property 2

Reason

.....

(4)

(f) The manufacturer of the batteries uses sampling during production.

Explain **one** reason for sampling during the manufacture of the batteries.

.....

.....

.....

(2)



(g) Two specification points for the timer are that it must be:

- easy to adjust the timing settings
- easy to read the display.

Explain, under the following headings, how the timer satisfies these specification points.

(i) Easy to adjust the timing settings.

.....
.....
.....
.....

(2)

(ii) Easy to read the display.

.....
.....
.....
.....

(2)

(Total 22 marks)

Q1

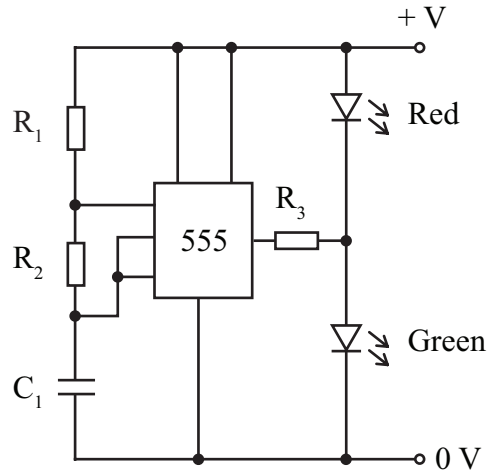
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2. The circuit below shows a 555 timer connected as an astable pulse generator.



(a) Describe the function of R_3 .

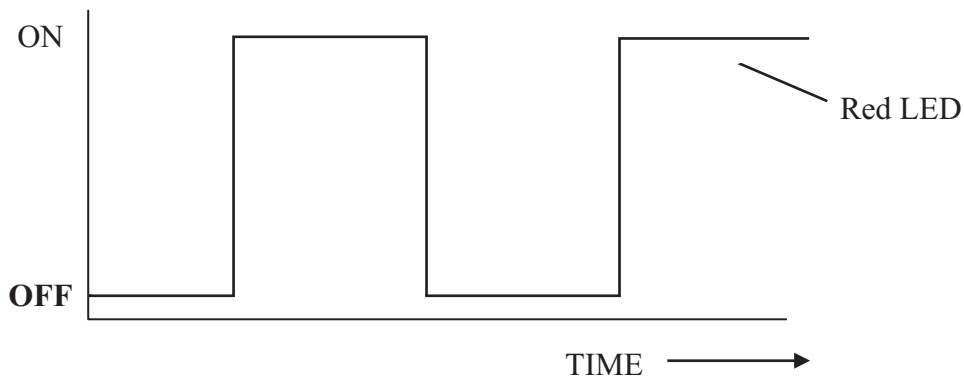
.....

(2)

(b) The graph below indicates when the red LED is on and when it is off.

On the same axes, draw a second graph to show when the green LED is on and when it is off.

(2)



(c) The manufacturer wishes to control the output frequency of the timer.

(i) State **two** components which control the output frequency of the timer.

1

2

(2)

(ii) Describe how the output frequency of this circuit could be made continuously variable.

.....

.....

(2)

(d) When a printed circuit board (PCB) has been produced, components must be inserted.

(i) Name the process used in industry for inserting components on thousands of identical circuits.

.....

(1)

(ii) Describe this process.

.....

.....

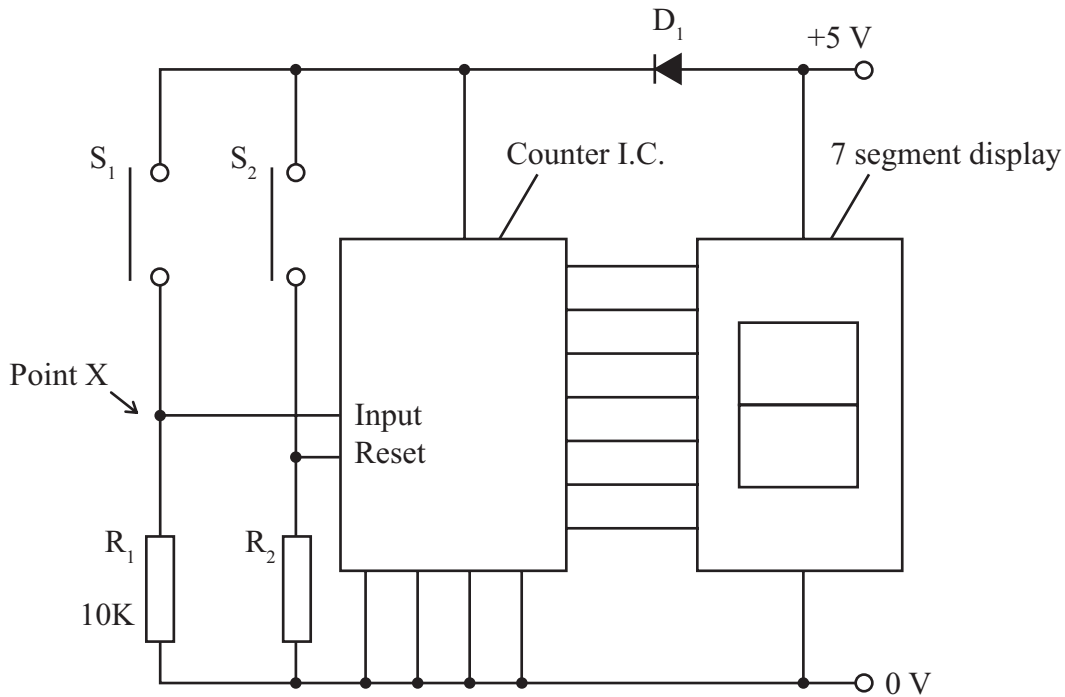
(2)

Q2

(Total 11 marks)



3. The diagram below shows the electronic circuit of a commercially available games scorer which counts from 0 to 9.



(a) Name the type of switch shown as S_1 .

..... (1)

(b) (i) State the effect on the circuit of operating switch S_1 .

..... (1)

(ii) State the effect on the circuit of operating switch S_2 .

..... (1)

(c) Give the voltage at point X on the circuit:

(i) when switch S_1 is closed (1)

(ii) when switch S_1 is open (1)



(d) Use the formula $I = V/R$ to calculate the current through resistor R_1 when switch S_1 is closed. Assume the counter IC draws no current.

.....
.....
.....

(2)

(e) D_1 in the circuit is a diode.

The diagrams below show a diode and its circuit symbol.

Use a + sign on **both** diagrams to indicate the polarity of the diode.

(2)



(f) One reason for using a seven-segment LED display is to show the numbers 0 to 9.

Give **two** other reasons for using a seven-segment LED display in this circuit.

1

2

.....

(2)

Q3

(Total 11 marks)

TOTAL FOR PAPER: 44 MARKS

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