

End of topic quiz - Topic 2.4 Boolean logic

1. Why do computers store data using binary? [1 mark]

2. Draw a logic diagram to represent the following expressions:

- a. **$P=A \text{ AND } B$** [2 marks]

- b. **$P=A \text{ OR } B$** [2 marks]

- c. **$P=(A \text{ AND } B) \text{ OR } C$** [2 marks]

- d. **$P=(A \text{ AND } B) \text{ AND NOT } C$** [2 marks]

3. Complete the Truth Tables for the following expressions:

a. $Q = (\text{NOT } A) \text{ AND } B$ [4 marks]

A	B	NOT A	Q

b. $Q = (\text{NOT } A) \text{ OR } B$ [4 marks]

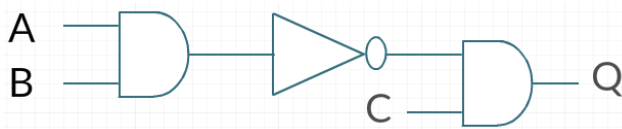
A	B	NOT A	Q

c. $Q = (A \text{ AND } B) \text{ OR } C$ [8 marks]

A	B	C	A AND B	Q

4. Write out the Boolean expressions to represent each of the following circuits: [4 marks]

a.



5. Complete the truth table below for the Boolean statement $p = \text{NOT } (A \text{ AND } B)$. [2 marks]

A	B	P
FALSE	FALSE	TRUE
FALSE	TRUE	
TRUE	FALSE	

TRUE	TRUE	FALSE
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6. A cinema uses the following criteria to decide if a customer is allowed to see a film that has a 15 rating:

Customers have to be 15 years of age or older to see the film. They also need to either have a ticket or have the money to buy a ticket.

The table shows the inputs to the system that will output whether the customer can watch the film.

Input	Criteria (True / False)
A	The customer is 15 or over
B	The customer has a ticket
C	The customer has the money to buy a ticket

Draw this system using logic gates. [2 marks]

/33

Answers

1. What do computers store data using Binary?

So that computers can be based on logic circuits.
... (each part of the circuit) can be in one of two states
... 0 and 1/true or false

2. Draw a logic diagram to represent the following expressions:

- a. **$P=A \text{ AND } B$**



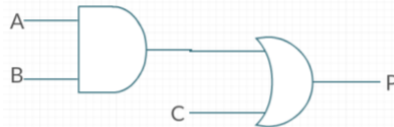
A, B and P correct.
Correct AND gate drawn.

- b. **$P=A \text{ OR } B$**



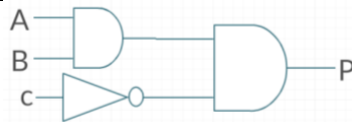
A, B and P correct.
Correct OR gate drawn.

- c. **$P=(A \text{ AND } B) \text{ OR } C$**



A AND B correct.
Joined to OR C.

- d. **$P=(A \text{ AND } B) \text{ AND NOT } C$**



A AND B correct, NOT C drawn correct.
Both (A AND B) and (NOT C) going into an AND gate.

3. Complete the Truth Tables for the following expressions:

a. $Q = (\text{NOT } A) \text{ AND } B$

A	B	NOT A	Q
0	0	1	0
0	1	1	1
1	0	0	0
1	1	0	0

b. $Q = (\text{NOT } A) \text{ OR } B$

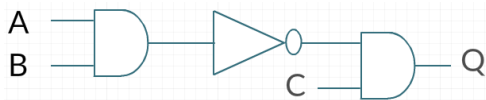
A	B	NOT A	Q
0	0	1	1
0	1	1	1
1	0	0	0
1	1	0	1

c. $Q = (A \text{ AND } B) \text{ OR } C$

A	B	C	A AND B	Q
0	0	0	0	0
0	0	1	0	1
0	1	0	0	0
0	1	1	0	1
1	0	0	0	0
1	0	1	0	1
1	1	0	1	1
1	1	1	1	1

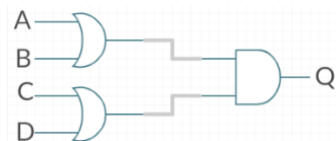
4. Write out the Boolean expressions to represent each of the following circuits:

a.



$Q = \text{NOT}(A \text{ AND } B)$
 $\text{AND } C$

b.



$Q = (A \text{ OR } B)$
 $\text{AND } (C \text{ OR } D)$

5. Complete the truth table below for the Boolean statement $p = \text{NOT} (A \text{ AND } B)$.

A	B	P
FALSE	FALSE	TRUE
FALSE	TRUE	TRUE
TRUE	FALSE	TRUE
TRUE	TRUE	FALSE

TRUE TRUE – 1 mark each

[2 marks]

6. A cinema uses the following criteria to decide if a customer is allowed to see a film that has a 15 rating:

Customers have to be 15 years of age or older to see the film. They also need to either have a ticket or have the money to buy a ticket.

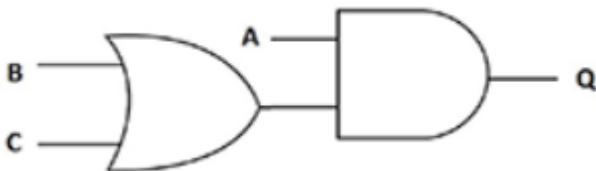
The table shows the inputs to the system that will output whether the customer can watch the film.

Input	Criteria (True / False)
A	The customer is 15 or over
B	The customer has a ticket
C	The customer has the money to buy a ticket

Draw this system using logic gates.

- OR gate with two inputs // AND gate with two inputs
- Diagram as shown in guidance with no additional gates

Marks: 2



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