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Started on	
State	
Completed on	
Time taken	
Marks	
Grade	
Feedback	

You are a highly motivated student, who takes full responsibility for your learning. A reflective learner, who recognises areas for development and is committed to personal improvement. An organised learner who always completes class work and homework to a very high standard.

Question 1

Correct

Mark 3.00 out of 3.00

By completing the truth table below, prove the following expression

$A + A.B = A$

A	B	A.B	A.B+A
0	0	<input type="text" value="0"/>	<input type="text" value="0"/>
0	1	<input type="text" value="0"/>	<input type="text" value="0"/>
1	0	<input type="text" value="0"/>	<input type="text" value="1"/>
1	1	<input type="text" value="1"/>	<input type="text" value="1"/>

Response history

Step	Time	Action	State	Marks
1	2/05/23, 18:11	Started	Not yet answered	
2	2/05/23, 18:13	Saved: part 1: 0; part 2: 0; part 3: 0; part 4: 0; part 5: 0; part 6: 1; part 7: 1; part 8: 1	Answer saved	
3	2/05/23, 18:48	Attempt finished	Correct	3.00

Question **2**

Correct

Mark 2.00 out of 2.00

$(A + B)(B + C)$ can be rewritten as:

- ☐ a. $C + AB$
- ☐ b. $A + B + C$
- ☐ c. ABC
- ☒ d. $B + AC$ ✓

Your answer is correct.

The correct answer is:

$B + AC$

Response history

Step	Time	Action	State	Marks
1	2/05/23, 18:11	Started	Not yet answered	
2	2/05/23, 18:15	Saved: [B + AC]	Answer saved	
3	2/05/23, 18:48	Attempt finished	Correct	2.00

Question **3**

Correct

Mark 2.00 out of 2.00

$ABC + AB'C + ABC' + A'BC$ can be rewritten as:

- ☐ a. $C(B \oplus A) + AC$
- ☐ b. $B(A \oplus B) + AC$
- ☒ c. $C(A \oplus B) + AB$ ✓
- ☐ d. $B(A \oplus C) + AB$

Your answer is correct.

The correct answer is:

$C(A \oplus B) + AB$

Response history

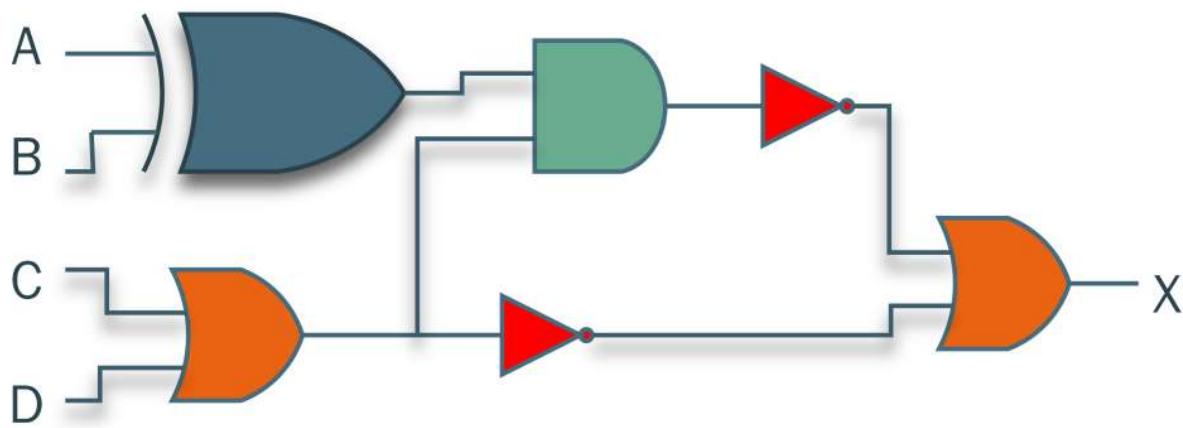
Step	Time	Action	State	Marks
1	2/05/23, 18:11	Started	Not yet answered	
2	2/05/23, 18:16	Saved: [$C(A \oplus B) + AB$]	Answer saved	
3	2/05/23, 18:48	Attempt finished	Correct	2.00

Question 4

Correct

Mark 2.00 out of 2.00

Which one of the following Boolean expressions best describes the above circuit?



- ☐ a. $((A + C).(C \oplus B))' + (C + D)'$
- ☒ b. $((A \oplus B).(C + D))' + (C + D)'$ ✓
- ☐ c. $((A.B) + (C.D)) + (C.D)'$
- ☐ d. $((A + C).(C \oplus B))' + (C + D)'$
- ☐ e. $((A \oplus B).(C + D)) + (C + D)'$

Your answer is correct.

The correct answer is:
 $((A \oplus B).(C + D))' + (C + D)'$

Response history

Step	Time	Action	State	Marks
1	2/05/23, 18:11	Started	Not yet answered	
2	2/05/23, 18:17	Saved: $((A \oplus B).(C + D))' + (C + D)'$	Answer saved	
3	2/05/23, 18:48	Attempt finished	Correct	2.00

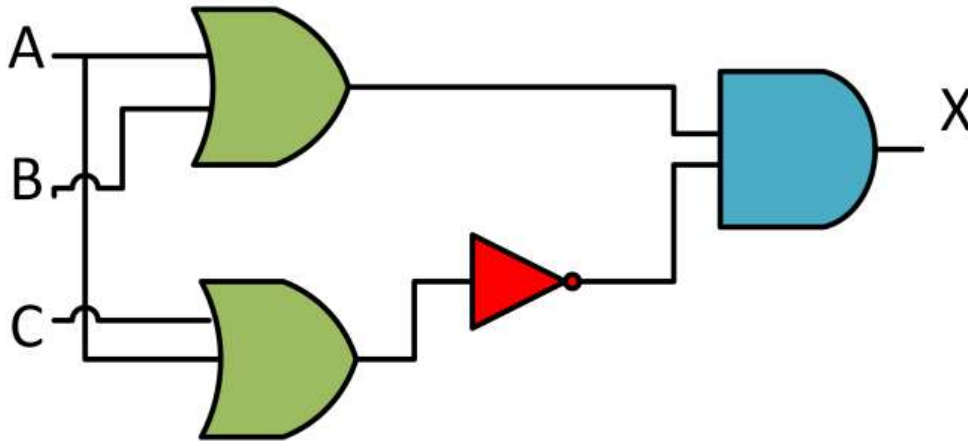
Question 5

Correct

Mark 2.00 out of 2.00

Suppose you can only use a single transistor to implement a NOT gate, two transistors to implement a NAND gate, and two transistors to implement a NOR gate. To implement all other types of gates, you must build them using only these three types of gates.

Given the above constraints, what is the minimum number of transistors required to build the circuit exactly as shown below?



Answer:

10



The correct answer is: 10

Response history

Step	Time	Action	State	Marks
1	2/05/23, 18:11	Started	Not yet answered	
2	2/05/23, 18:19	Saved: 10	Answer saved	
3	2/05/23, 18:48	Attempt finished	Correct	2.00

Question **6**

Correct

Mark 2.00 out of 2.00

Which one of the following properties do not hold in Boolean algebra?

- ☐ a. $x + x = x$
- ☒ b. $x.(x + y) = x + y$ ✓
- ☐ c. $x + y = y + x$
- ☐ d. $x.(x + y) = x$
- ☐ e. $x + (yz) = (x + y)(x + z)$

Your answer is correct.

The correct answer is:

$x.(x + y) = x + y$

Response history

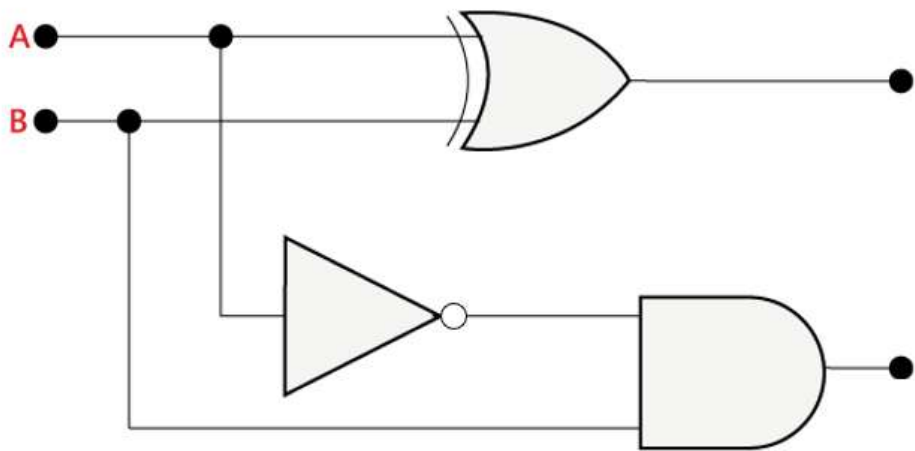
Step	Time	Action	State	Marks
1	2/05/23, 18:11	Started	Not yet answered	
2	2/05/23, 18:22	Saved: $x.(x + y) = x + y$	Answer saved	
3	2/05/23, 18:48	Attempt finished	Correct	2.00

Question **7**

Correct

Mark 1.00 out of 1.00

Given the following Circuit:
What gates are used to create it?



- ☐ a. OR Gate
- ☒ b. XOR ✓
- ☒ c. AND Gate ✓
- ☐ d. None of the above
- ☐ e. NOR
- ☒ f. NOT ✓
- ☐ g. NAND

Your answer is correct.

The correct answers are:

AND Gate,

XOR,

NOT

Response history

Step	Time	Action	State	Marks
1	2/05/23, 18:11	Started	Not yet answered	
2	2/05/23, 18:23	Saved: XOR ; AND Gate ; NOT	Answer saved	
3	2/05/23, 18:48	Attempt finished	Correct	1.00

Question **8**

Correct

Mark 3.00 out of 3.00

A	B	C	Out
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1

What is the Boolean expression for out in the following truth table?

- ☒ a. $AB + A'B'$ ✓
- ☐ b. $AB + AB'C$
- ☐ c. $A'BC + AB'C$
- ☐ d. $A'C + AC$

Your answer is correct.

The correct answer is:

$AB + A'B'$

Response history

Step	Time	Action	State	Marks
1	2/05/23, 18:11	Started	Not yet answered	
2	2/05/23, 18:30	Saved: $AB + A'B'$	Answer saved	
3	2/05/23, 18:48	Attempt finished	Correct	3.00

Question 9

Correct

Mark 2.00 out of 2.00

Suppose you can only use a single transistor to implement a NOT gate, two transistors to implement a NAND gate, and two transistors to implement a NOR gate. To implement all other types of gates, you must build them using only these three types of gates.

Using these constraints, what is the minimum number of transistors you would need to implement the XOR gate?

Answer:



The correct answer is: 8

Response history

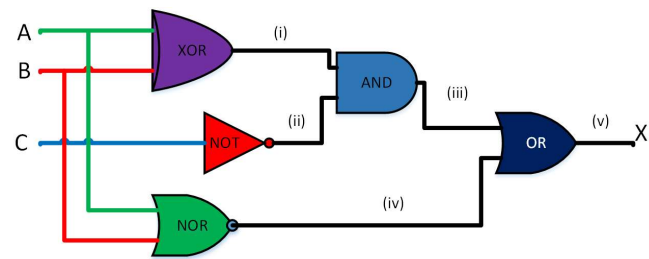
Step	Time	Action	State	Marks
1	2/05/23, 18:11	Started	Not yet answered	
2	2/05/23, 18:30	Saved: 8	Answer saved	
3	2/05/23, 18:48	Attempt finished	Correct	2.00

Question 10

Partially correct

Mark 5.00 out of 5.00

Show the behaviour of the circuit given below by completing the below truth table.



ABC	(i)	(ii)	(iii)	(iv)	(v)
000	0	1	0	1	1
	✓	✓	✓	✓	✓
001	0	0	0	1	1
	✓	✓	✓	✓	✓
010	1	1	1	0	1
	✓	✓	✓	✓	✓
011	1	0	0	0	0
	✓	✓	✓	✓	✓
100	1	1	1	0	1
	✓	✓	✓	✓	✓
101	1	0	0	0	0
	✓	✓	✓	✓	✓
110	0	1	0	0	0
	✓	✓	✓	✓	✓
111	0	0	0	0	0
	✓	✓	✓	✓	✓

Write a Boolean expression for the above circuit in its simplest form?

(A'B+AB').C' + (A + B)'

✗ (e.g. (A.B'.C)'or C.(A+B))

NB: If you answer includes an XOR gate, then write it using NOT, AND, and OR gates.

Response history

Step	Time	Action	State	Marks
1	2/05/23, 18:11	Started	Not yet answered	
2	2/05/23, 18:35	Saved: part 1: 0; part 2: 1; part 3: 0; part 4: 1; part 5: 1; part 6: 0; part 7: 0; part 8: 0; part 9: 1; part 10: 1; part 11: 1; part 12: 1; part 13: 1; part 14: 0; part 15: 1; part 16: 1; part 17: 0; part 18: 0; part 19: 0; part 20: 0; part 21: 1; part 22: 1; part 23: 1; part 24: 0; part 25: 1; part 26: 1; part 27: 0; part 28: 0; part 29: 0; part 30: 0; part 31: 0; part 32: 1; part 33: 0; part 34: 0; part 35: 0; part 36: 0; part 37: 0; part 38: 0; part 39: 0; part 40: 0; part 41: $(A \oplus B).C' + (A + B)'$	Answer saved	
3	2/05/23, 18:46	Saved: part 1: 0; part 2: 1; part 3: 0; part 4: 1; part 5: 1; part 6: 0; part 7: 0; part 8: 0; part 9: 1; part 10: 1; part 11: 1; part 12: 1; part 13: 1; part 14: 0; part 15: 1; part 16: 1; part 17: 0; part 18: 0; part 19: 0; part 20: 0; part 21: 1; part 22: 1; part 23: 1; part 24: 0; part 25: 1; part 26: 1; part 27: 0; part 28: 0; part 29: 0; part 30: 0; part 31: 0; part 32: 1; part 33: 0; part 34: 0; part 35: 0; part 36: 0; part 37: 0; part 38: 0; part 39: 0; part 40: 0; part 41: $(A'B+AB').C' + (A + B)'$	Answer saved	
4	2/05/23, 18:48	Attempt finished	Partially correct	5.00

Question **11**

Correct

Mark 2.00 out of 2.00

Design a circuit for a "half-subtractor" i.e. a circuit which takes two bits X and Y and outputs X-Y and B, the borrow required.

Complete the truth table below for the half-subtractor.

XY	Diff(X-Y)	Borrow
00	<div>0</div>	<div>0</div>
01	<div>1</div>	<div>1</div>
10	<div>1</div>	<div>0</div>
11	<div>0</div>	<div>0</div>

Response history

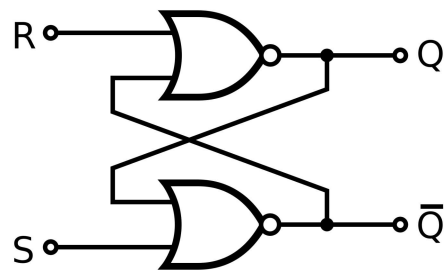
Step	Time	Action	State	Marks
1	2/05/23, 18:11	Started	Not yet answered	
2	2/05/23, 18:36	Saved: part 1: 0; part 2: 0; part 3: 1; part 4: 1; part 5: 1; part 6: 0; part 7: 0; part 8: 0	Answer saved	
3	2/05/23, 18:48	Attempt finished	Correct	2.00

Question 12

Correct

Mark 3.00 out of 3.00

Consider the circuit below which is called an RS Flip-Flop.



What happens to the output if:

(a) R is set to 1 and S is set to 0? Q =

0

✓, \bar{Q} =

1

✓.

(b) R is set to 0 and S is set to 1? Q =

1

✓, \bar{Q} =

0

✓.

(c) R and S are both 1? Q =

0

✓, \bar{Q} =

0

✓.

Response history

Step	Time	Action	State	Marks
1	2/05/23, 18:11	Started	Not yet answered	
2	2/05/23, 18:40	Saved: part 1: 0; part 2: 1; part 3: 1; part 4: 0; part 5: 0; part 6: 0	Answer saved	
3	2/05/23, 18:48	Attempt finished	Correct	3.00

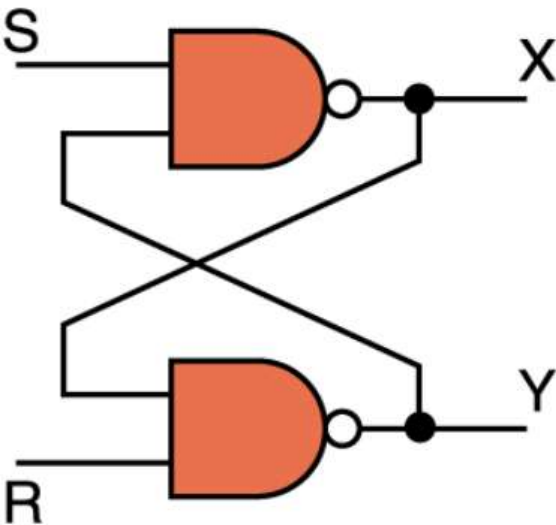
Question **13**

Correct

Mark 1.00 out of 1.00

Given the Diagram below determine the values of X and Y given :

S = 0, R = 1



Select one:

- ☐ a. X=0, Y=0.
- ☒ b. X=1, Y=0. ✓
- ☐ c. X=0, Y=1.
- ☐ d. X=1, Y=1.
- ☐ e. The circuit oscillates between 0s and 1s.

The correct answer is: X=1, Y=0.

Response history

Step	Time	Action	State	Marks
1	2/05/23, 18:11	Started	Not yet answered	
2	2/05/23, 18:37	Saved: X=1, Y=0.	Answer saved	
3	2/05/23, 18:48	Attempt finished	Correct	1.00

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