IN1006 Systems Architecture (PRD1 A 2022/23)

Started on	Thursday, 17 November 2022, 3:45 PM
State	Finished
Completed on	Thursday, 17 November 2022, 4:00 PM
Time taken	14 mins 45 secs
Grade	10.00 out of 10.00 (100%)

Question 1

Correct

Mark 1.00 out of 1.00

Which of the following statements is *the most accurate* description for the sum-of-products expression below?

$$F = A'BC + ABC' + AB'C'$$

Select one:

- a. The truth table has three rows where F = 1 and no zeros need to be in the inputs to return one.
- b. The truth table has three rows where F = 1 and B must be one to return one.
- c. The truth table has three rows where F = 1 and at least one zero must be in the inputs to return one. ✔
- d. The truth table has four rows where F = 1 and no zeros need to be in the inputs to return one.
- e. The truth table has two rows where F = 1 and no zeros need to be in the inputs to return one.
- f. Don't know/no answer.

The number of OR-ed terms above specifies the number of input cases that lead to a true expression (rows of truth table that give F = 1). Each of the inverted variables shows where the input needs to be zero for that input case.

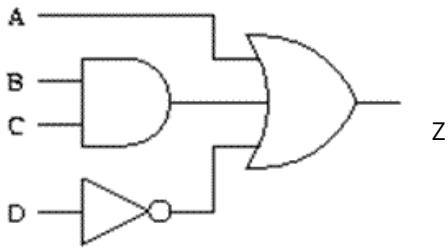
The correct answer is: The truth table has three rows where F = 1 and at least one zero must be in the inputs to return one.

Question 2

Correct

Mark 1.00 out of 1.00

Given the logic circuit and table below, which line of the table does *not* correspond with the behaviour of the logic circuit (with output Z)?



Row	A	B	C	D	Z
1	0	0	0	0	1
2	0	0	0	1	0
3	0	0	1	0	1
4	0	0	1	1	0
5	0	1	0	0	1
6	0	1	0	1	0
7	0	1	1	0	1
8	0	1	1	1	1
9	1	0	0	0	1
10	1	0	0	1	1
11	1	0	1	0	1
12	1	0	1	1	1
13	1	1	0	0	1
14	1	1	0	1	1
15	1	1	1	0	0
16	1	1	1	1	1

Select one:

- a. Row 11
- b. Row 6
- c. Row 13
- d. Row 15 ✔
- e. Row 1
- f. Row 7
- g. Don't know/no answer
- h. Row 3
- i. Row 10

Row 15 is in error as since A is an input to the final OR-gate and Z should be one when A is one.

The correct answer is: Row 15

Question 3

Correct

Mark 1.00 out of 1.00

Which of the following equations correctly reflects the truth table shown below? A, B and C are inputs and F is the output.

A	B	C	F
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1

Select one:

- a. F = (A'B'C + A'BC' + AB'C + A'B'C + ABC)'
- b. F = A'B'C + A'BC' + AB'C + ABC ✔
- c. F = A'B'C' + A'BC + AB'C' + ABC'
- d. None of these expressions
- e. Don't know/no answer
- f. F = A'B'C ' + A'B'C + AB'C' + ABC'

Your answer is correct.

The F output is given as a sum-of-products expression where each product (AND) should correspond to a row where F = 1.

The correct answer is: F = A'B'C + A'BC' + AB'C + ABC

Question 4

Correct

Mark 1.00 out of 1.00

Which of the following equations correctly reflects the truth table shown below? A,B and C are inputs and F is the output.

A	B	C	F
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1

Select one:

- a. F = A'BC' + A'BC + AB'C' + ABC' + ABC ✔
- b. None of these expressions
- c. F = (AB'C + A'BC' + A'BC' + A'B'C + A'B'C')'
- d. Don't know/no answer
- e. F = (A'BC ' + A'BC + AB'C' + ABC' + ABC)'
- f. F = AB'C + A'BC' + A'BC' + A'B'C + A'B'C'

The F output is given as a sum-of-products expression where each product (AND) should correspond to a row where F = 1.

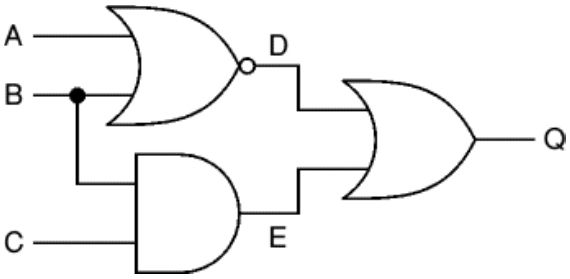
The correct answer is: F = A'BC' + A'BC + AB'C' + ABC' + ABC

Question 5

Correct

Mark 1.00 out of 1.00

Which of the following is the correct Boolean expression for the logic circuit below (with output Q).



Select one:

- a. Q = (AB)' + (B+C)
- b. Q = (A+B) + (BC)
- c. Q = (A+B)' + (BC) ✔
- d. Q = (A+B)'(BC)
- e. Don't know/no answer

Output Q is OR of a NOR-gate (D) with inputs A, B and an AND-gate (E) with inputs B, C. This gives the expression:
Q = (A+B)' + (BC)

The correct answer is: Q = (A+B)' + (BC)

Question 6

Correct

Mark 1.00 out of 1.00

What is the effect of a bitwise-XOR operation on the following 12-bit words: 1000 1010 1101, 0110 1110 0101?

Select one:

- a. 0000 1100 0101
- b. 1110 0100 1000 ✔
- c. 0001 0001 0010
- d. 1111 0011 1010
- e. 1110 1110 1101
- f. Don't know/no answer

The XOR operation is applied to each of the pairs of bits at the same position in each word, moving from left to right.

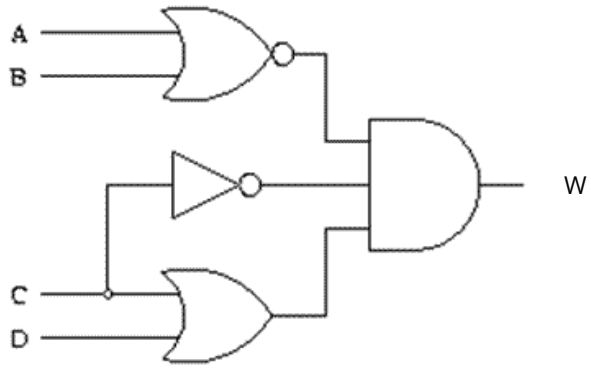
The correct answer is: 1110 0100 1000

Question 7

Correct

Mark 1.00 out of 1.00

Given the logic circuit (with output W) and table below, which line of the table does *not* correspond with the behaviour of the logic circuit?



Row	A	B	C	D	Z
1	0	0	0	0	0
2	0	0	0	1	1
3	0	0	1	0	0
4	0	0	1	1	0
5	0	1	0	0	0
6	0	1	0	1	0
7	0	1	1	0	0
8	0	1	1	1	1
9	1	0	0	0	0
10	1	0	0	1	0
11	1	0	1	0	0
12	1	0	1	1	0
13	1	1	0	0	0
14	1	1	0	1	0
15	1	1	1	0	0
16	1	1	1	1	0

Select one:

- a. Row 3
- b. Row 5
- c. Row 10
- d. Row 8 ✔
- e. Row 15
- f. Don't know/no answer
- g. Row 12
- h. Row 1
- i. Row 7

Row 8 is in error as all inputs to the AND gate must be one for W to be one, and this only occurs when the conditions in row two are met.

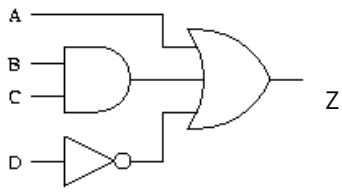
The correct answer is: Row 8

Question 8

Correct

Mark 1.00 out of 1.00

Which of the following is the correct Boolean expression for the logic circuit below (with output Z).



Select one:

- a. Z = A + (BC) + D' ✔
- b. Don't know/no answer
- c. Z = A + (B+C)D'
- d. Z = A' + (BC) + D'
- e. Z= A + (BC) + D

Input D feeds directly into a NOT gate so is inverted to D'. Inputs B and C are AND-ed together. Then all are OR-ed together with A to give the expression:

$Z = A + (BC) + D'$.

The correct answer is: Z = A + (BC) + D'

Question 9

Correct

Mark 1.00 out of 1.00

What is the effect of a bitwise-NAND operation on the following two 12-bit words: 1000 1010 1101, 0110 1110 0101 ?

Select one:

- a. 0000 1100 0101
- b. 1111 0101 1010 ✔
- c. 0001 0001 0010
- d. 1110 0100 1000
- e. 1110 1110 1101
- f. Don't know/no answer

The NAND operation is applied to each of the pairs of bits at the same position in each word, moving from left to right.

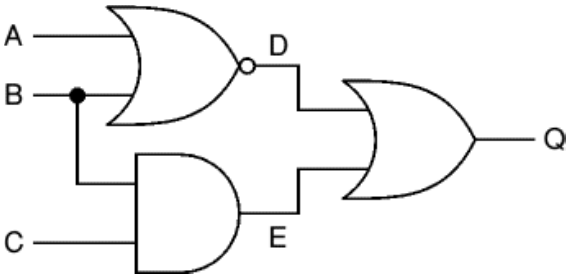
The correct answer is: 1111 0101 1010

Question 10

Correct

Mark 1.00 out of 1.00

Given the logic circuit and table below (with output Q), which line of the table does *not* correspond to the behaviour of the logic circuit?



Row	A	B	C	Q
1	0	0	0	1
2	0	0	1	1
3	0	1	0	1
4	0	1	1	1
5	1	0	0	0
6	1	0	1	0
7	1	1	0	0
8	1	1	1	1

Select one:

- a. Row 8
- b. Don't know/no answer
- c. All rows are correct
- d. Row 7
- e. Row 5
- f. Row 2
- g. Row 4
- h. Row 1
- i. Row 3 ✔
- j. Row 6

Row 3 is in error as the output of the NOR-gate (D) and AND-gate (E) are zero, leading to an output of the OR-gate (Q) of zero.

The correct answer is: Row 3

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