

IN1006 Systems Architecture (PRD1 A 2022/23)

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Started on Thursday, 1 December 2022, 3:57 PM

State Finished

Completed on Thursday, 1 December 2022, 4:15 PM

Time taken 18 mins 8 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?

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

Select one:

- ☒ a. The truth table has three rows where $F = 1$ and no more than two zeros must be in the inputs to return one. ✓
- ☐ b. The truth table has three rows where $F = 1$ and C must be one to return one.
- ☐ c. The truth table has two rows where $F = 1$ and C must be zero to return one.
- ☐ d. The truth table has four rows where $F = 1$ and no more than two zeros must be in the inputs to return one.
- ☐ e. The truth table has three 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 barred 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 no more than two zeros must be in the inputs to return one.

Question **2**

Correct

Mark 1.00 out of 1.00

Which of the following best describes the composition of a 32-bit register.

Select one:

- ☐ a. 64 D flip-flops.
- ☐ b. 32 SR flip-flops
- ☐ c. Don't know/no answer
- ☐ d. 16 D flip-flops and 16 SR flip-flops.
- ☐ e. 32 D flip-flops and 32 SR flip-flops
- ☒ f. 32 D flip-flops



A n-bit register is built from n-D flip-flops connected by a bus.

The correct answer is: 32 D flip-flops

Question **3**

Correct

Mark 1.00 out of 1.00

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

Select one:

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



The OR 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 1110 1101

Question **4**

Correct

Mark 1.00 out of 1.00

Which of the following statements best describes the FDE cycle? FDE cycle is ...

Select one:

- ☐ a. ... part of the Input/Output subsystem of the von Neumann model.
- ☐ b. ...an important hardware technology used to build processors.
- ☐ c. ... loop instruction in MARIE architecture.
- ☒ d. ...the series of steps that a computer carries out when it runs a program
is the series of steps that a computer carries out when it runs a program
is the series of steps that a computer carries out when it runs a program
.
- ☐ e. Don't know/No response

✓ This is correct.

Your answer is correct.

The correct answer is: ...the series of steps that a computer carries out when it runs a program
is the series of steps that a computer carries out when it runs a program

is the series of steps that a computer carries out when it runs a program
.

Question 5

Correct

Mark 1.00 out of 1.00

Consider the following MARIE code. What does this code do?

```
If,      Load X
          Add X
          Subt Y
          Skipcond 400
          Jump Else
Then,    Load X
          Add X
          Output
          Jump Endif
Else,    Load Y
          Subt X
          Store Y
Endif,   Halt
X,       Dec 10
Y,       Dec 12
```

Select one:

- ☒ a. It will store the decimal value 2 in the memory address Y and terminate.
- ☐ b. It will output the hexadecimal value 2 and terminate.
- ☐ c. It will output the decimal value 2 and terminate.
- ☐ d. It will compute and store the decimal value 3 and terminate.
- ☐ e. It will store the decimal value 12 in the memory position X and terminate.



This program executes an "If, then, else" statement using the Skipcond instruction. In this case, the condition in Skipcond is 01. So, PC will become PC+1 if AC=0 and the "Then" part of the code will be executed. If AC <> 0 then the "Else" part of the code will be executed. After the execution of the first three statements, AC will be 8, so the "Else" part of the code will be executed. So the program will compute Y-X=2, store this value in memory position Y and will terminate.

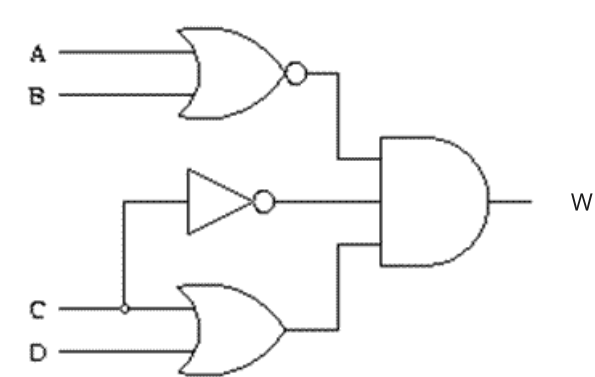
The correct answer is: It will store the decimal value 2 in the memory address Y and terminate.

Question 6

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

Does the following sequence of microoperations or any subsequence of it correspond to any MARIE instruction and if so which?

$MAR \leftarrow Y$
 $MBR \leftarrow M[MAR]$
 $MAR \leftarrow MBR$
 $MBR \leftarrow M[MAR]$
 $AC \leftarrow AC + MBR$

Select one:

- ☒ a. ADDI Y
- ☐ b. There is no MARIE instruction that corresponds to the above sequence of micro operations or a subsequence of it.
- ☐ c. LOADI Y
- ☐ d. LOADI Y+Y
- ☐ e. ADD AC+Y



The first microoperation assigns Y to MAR. The next 3 microoperations load the value of the memory word whose address is the value of the memory word with address Y to MBR. And the final microoperation adds the value of MBR to AC. Hence given microoperations correspond to the MARIE instruction ADDI Y.

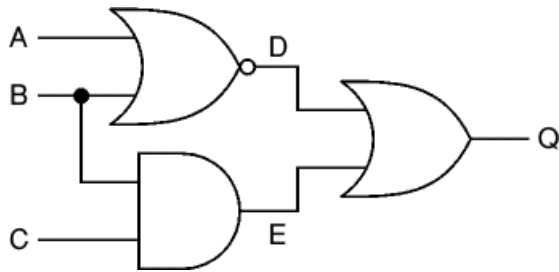
The correct answer is: ADDI Y

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 Q).



Select one:

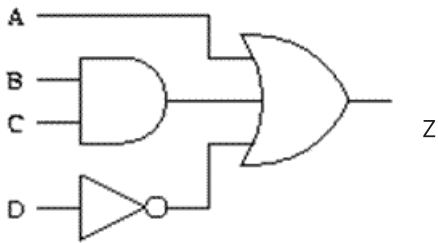
- ☐ a. $Q = (A+B) + (BC)$
- ☒ b. $Q = (A+B)' + (BC)$
- ☐ c. $Q = (A+B)'(BC)$
- ☐ d. $Q = (AB)' + (B+C)$
- ☐ e. Don't know/no answer



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: $Q = (A+B)' + (BC)$

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



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 **10**

Correct

Mark 1.00 out of 1.00

Which MARIE instruction is being carried out by the microoperations that follow?

$MAR \leftarrow X$

$MBR \leftarrow M[MAR]$

$AC \leftarrow AC - MBR$

Select one:

- ☐ a. Don't know/No answer
- ☐ b. Store X
- ☐ c. Jump X
- ☐ d. Load X
- ☒ e. Subt X



The correct answer is: Subt X

◀ Quiz 4 _ Weekly Assessed Quiz 2022

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