

IN1006 Systems Architecture (PRD1 A 2022/23)

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Started on Thursday, 1 December 2022, 3:33 PM

State Finished

Completed on Thursday, 1 December 2022, 3:53 PM

Time taken 19 mins 56 secs

Grade 10.00 out of 10.00 (100%)

Question 1

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



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 **2**

Correct

Mark 1.00 out of 1.00

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

```
If,      Load 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 5
```

Select one:

- ☐ a. It will output the hexadecimal value -5 and terminate.
- ☒ b. It will compute the decimal value -5, store it in Y and terminate.
- ☐ c. It will store the octal value 5 and terminate.
- ☐ d. It will compute and store the decimal value 5.
- ☐ e. It will store the hexadecimal value -5 in the memory address 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 two statements, AC will be 5, so the "Else" part of the code will be executed. So the program will compute Y-X=-5, store this value in Y and terminate.

The correct answer is: It will compute the decimal value -5, store it in Y and terminate.

Question **3**


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 zeros need to 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 more than two zeros must 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 **4**

Correct

Mark 1.00 out of 1.00

What is the difference in operation between a LOAD x and a LOADI x instruction?

Select one:

- ☐ a. Don't know/No answer
- ☐ b. LOAD loads the value x to the AC; LOADI loads the value found at x to the AC
- ☐ c. The LOAD loads the value at address x to the AC; the LOADI loads the value x to the AC
- ☐ d. There is no difference if x is the same
- ☒ e. The LOAD loads the value at address x to the AC; the LOADI loads the value found in the location addressed by the value in x to the AC 

Your answer is correct.

The correct answer is: The LOAD loads the value at address x to the AC; the LOADI loads the value found in the location addressed by the value in x to the AC

Question **5**

Correct

Mark 1.00 out of 1.00

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

$MAR \leftarrow X$

$MBR \leftarrow M[MAR]$

$AC \leftarrow MBR$

Select one:

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



Your answer is correct.

The correct answer is: Load X

Question **6**

Correct

Mark 1.00 out of 1.00

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

$MAR \leftarrow X$

$MBR \leftarrow AC$

$M[MAR] \leftarrow MBR$

Select one:

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



The correct answer is: Store X

Question 7

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



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

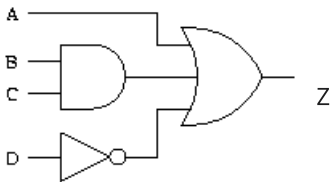
The correct answer is: 1110 0100 1000

Question 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. $Z = A + (B+C)D'$
- ☐ b. Don't know/no answer
- ☐ c. $Z = A' + (BC) + D'$
- ☒ d. $Z = A + (B \cdot C) + D'$
- ☐ 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: $Z = A + (B \cdot C) + D'$

Question 9

Correct

Mark 1.00 out of 1.00

How many components of MARIE architecture can use the bus simultaneously?

Select one:

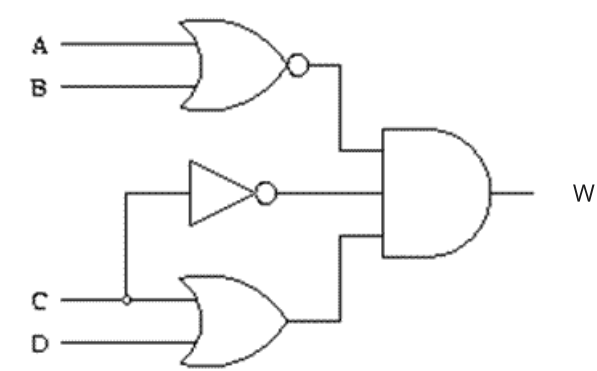
- ☐ a. 2 components
- ☐ b. All components
- ☐ c. Don't Know/No answer
- ☐ d. 3 components
- ☒ e. 1 component



Your answer is correct.

The correct answer is: 1 component

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



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