

IN1006 Systems Architecture (PRD1 A 2022/23)

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Started on Thursday, 24 November 2022, 4:40 PM

State Finished

Completed on Thursday, 24 November 2022, 5:00 PM

Time taken 20 mins 26 secs

Grade 10.00 out of 10.00 (100%)

Question 1

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

Correct

Mark 1.00 out of 1.00

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

Select one:

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



Your answer is correct.

The correct answer is: 1 component

Question **3**

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



Your answer is correct.

The correct answer is: Load X

Question **4**

Correct

Mark 1.00 out of 1.00

Consider the following MARIE program. What is the outcome of the program?

```
          Load X
          Store Sum
LoopC,    Skipcond 800
          Jump LoopEnd
Loop,     Subt Y
          Store W
          Add Sum
          Store Sum
          Load W
          Jump LoopC
LoopEnd,  Halt
X,        Dec 4
Y,        Dec 1
Sum,      Dec 0
W,        Dec 0
```

Select one:

- ☐ a. The program will halt immediately after reaching the Skipcond instruction for the first time.
- ☐ b. The program will compute the sum $4+3+2+1+0$ before ending.
- ☐ c. The program will compute the expression $4+2+0$ before ending.
- ☒ d. The program will compute the sum $4+3+2+1+0$ and store it in Sum before ending.
- ☐ e. The program will output the values 4, 3, 2, 1 and 0 before ending.



This program executes a "Loop" using the Skipcond instruction. In this case, the condition in Skipcond is set to 10 and so IR[11-10] is 10. Thus, if $AC > 0$ then PC will become PC+1 and the execution will continue from "Loop". Otherwise, the execution will continue from "LoopEnd". Initially (after the execution of the first two statements) the AC will be 4 (>0) and the value 4 will be stored in Sum. Thus the instruction at the position "Loop" will be executed subtracting 1 from AC, adding its value to Sum and storing the updated value to Sum (this will make the value of Sum equal to 7, i.e., $4+3$). Then the execution will continue from LoopC (due to the "Jump LoopC" instruction). This time the AC will be 3 so the evaluation of Skipcond will make the program continue from "Loop" again, this time subtracting 1 first from AC and then adding its value (i.e., 2) to Sum. This will continue until AC becomes 0, at which point the program execution will jump to "LoopEnd" and will be halted. Thus, the program will find the sum of values $4+3+2+1+0$ and store it in the memory position Sum before halting.

The correct answer is: The program will compute the sum $4+3+2+1+0$ and store it in Sum before ending.

Question **5**

Correct

Mark 1.00 out of 1.00

Which MARIE instruction is being carried out by the microoperation that follows?

$PC \leftarrow X$

Select one:

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



The correct answer is: Jump X

Question **6**

Correct

Mark 1.00 out of 1.00

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

$MAR \leftarrow X$

$MBR \leftarrow M[MAR]$

$AC \leftarrow AC + MBR$

Select one:

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



The correct answer is: Add X

Question **7**

Correct

Mark 1.00 out of 1.00

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

Select one:

- ☐ a. Don't know/no answer
- ☐ b. 32 SR flip-flops
- ☐ c. 64 D flip-flops.
- ☒ d. 32 D flip-flops
- ☐ e. 16 D flip-flops and 16 SR flip-flops.
- ☐ f. 32 D flip-flops and 32 SR 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 **8**

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 compute the decimal value -5, store it in Y and terminate.
- ☐ b. It will store the octal value 5 and terminate.
- ☐ c. It will output the hexadecimal value -5 and terminate.
- ☐ d. It will store the hexadecimal value -5 in the memory address X and terminate.
- ☐ e. It will compute and store the decimal value 5.



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 9

Correct

Mark 1.00 out of 1.00

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. There is no MARIE instruction that corresponds to the above sequence of micro operations or a subsequence of it.
- ☐ b. LOADI Y
- ☐ c. ADD AC+Y
- ☐ d. LOADI Y+Y
- ☒ e. ADDI 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 10

Correct

Mark 1.00 out of 1.00

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

$MAR \leftarrow X$
 $MBR \leftarrow AC$
 $M[MAR] \leftarrow MBR$

Select one:

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



The correct answer is: Store X

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