IN1006 Systems Architecture (PRD1 A 2022/23)

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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
        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 10
```

Select one:

- a. It will compute and store the decimal value 20 and terminate.
- b. It will store the hexadecimal value 5 and terminates.
- c. It will outputs the hexadecimal value 10 and terminate.
- d. It will output the decimal value 20 and terminate. ✔
- e. It will store the hexadecimal value 20 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 0, so the "Then" part of the code will be executed. So the program will compute X+X=20, will output this value and will terminate.

The correct answer is: It will output the decimal value 20 and terminate.

Question 2

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

Your answer is correct.

The correct answer is: Load X

Question 3

Correct

Mark 1.00 out of 1.00

Which MARIE instruction is being carried out by the following microoperations?

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

Select one:

- a. STORE AC+MAR
- b. LOAD Y
- c. ADD Y
- d. STORE Y ✔ Correct
- e. Neither the above sequence nor any subsequence of it corresponds to a MARIE instruction.

Your answer is correct.

The first microoperation assigns Y to MAR. The second microoperation assigns the value of AC to MBR, and the last microoperation stores the value of MBR to the memory word with the address indicated by MAR. Hence given microoperations correspond to the MARIE instruction STORE Y.

The correct answer is: STORE Y

Question 4

Correct

Mark 1.00 out of 1.00

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

```
            Clear
            Add X
            Store Sum
LoopC,      Skipcond 800
            Jump LoopEnd
Loop,       Output
            Subt Y
            Jump LoopC
LoopEnd,    Halt
X,          Dec 10
Y,          Dec 2
Sum,        Dec 0
```

Select one:

- a. The program will compute the expression 10+8+6+4+2 (i.e., 30) before ending.
- b. The program will output 2 for five consecutive times before ending.
- c. The program will compute the expression 10, 9, 8, 7 and 6 before ending.
- d. The program will output the decimal numbers 10, 8, 6, 4 and 2 before ending. ✔
- e. The program will output the decimal numbers 10, 8, 6, 4, 2 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 10 (>0) and thus the instruction at the position "Loop" will be executed outputing 10 (i.e., the current value of AC). Then 2 will be subtracted from AC and the execution will continue from LoopC (due to the "Jump LoopC" instruction). This time the AC will be 8 so the evaluation of Skipcond will make the program continue from "Loop" again, this time outputing 8 first and then subtracting 2 from it. 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 output the values 10, 8, 6, 4 and 2 before halting.

The correct answer is: The program will output the decimal numbers 10, 8, 6, 4 and 2 before ending.

Question 5

Correct

Mark 1.00 out of 1.00

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

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

Select one:

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

The correct answer is: Add X

Question 6

Correct

Mark 1.00 out of 1.00

Which of the following pair of values usually make up an instruction in a simple instruction set?

Select one:

- a. OpCode, Address ✔
- b. Operation, Instruction Length
- c. Don't know/No answer
- d. Operation, FDE
- e. Operand, Address

Your answer is correct.

The correct answer is: OpCode, Address

Question 7

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

The correct answer is: Jump X

Question 8

Correct

Mark 1.00 out of 1.00

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

```
        Clear
        Add X
LoopC,  Skipcond 800
        Jump LoopEnd
Loop,   Output
        Subt Y
        Jump LoopC
LoopEnd, Halt
X,      Dec 5
Y,      Dec 1
```

Select one:

- a. The program will output the decimal numbers 5, 4, 3, 2 and 1 before ending. ✔
- b. The program will compute the expression 5 - 4 - 3 -2 -1 (i.e., - 5) before ending.
- c. The program will do nothing.
- d. The program will compute the expression 5 + 4 + 3 + 2 +1 (i.e., 15) before ending.
- e. The program will output the decimal numbers 5, 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 5 (>0) and thus the instruction at the position "Loop" will be executed outputing 5 (i.e., the current value of AC). Then 1 will be subtracted from AC and the execution will continue from LoopC (due to the "Jump LoopC" instruction). This time the AC will be 4 so the evaluation of Skipcond will make the program continue from "Loop" again, this time outputing 4 first and then subtracting 1 from it. 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 output the values 5, 4, 3, 2 and 1 before halting.

The correct answer is: The program will output the decimal numbers 5, 4, 3, 2 and 1 before ending.

Question 9

Correct

Mark 1.00 out of 1.00

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

Select one:

- a. Don't know/No response
- b. ... part of the Input/Output subsystem of the von Neumann model.
- 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. ...an important hardware technology used to build processors.

✔ 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 10

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

◄ Quiz 3 _ Weekly Assessed Quiz 2022

Jump to...

Quiz 5 _ Weekly Assessed Quiz 2022 ►

Quiz navigation

1 2 3 5 6 7 8 9

Show one page at a time

Finish review