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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 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 compute the expression 10, 9, 8, 7 and 6 before ending.
- ● c. The program will output the decimal numbers 10, 8, 6, 4 and 2 before ending. ✔
- d. The program will output the decimal numbers 10, 8, 6, 4, 2 and 0 before ending.
- e. The program will output 2 for five consecutive times 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.

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

The correct answer is: Add X

Question **3**

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. LOADI Y
- ○ b. There is no MARIE instruction that corresponds to the above sequence of micro operations or a subsequence of it.
- ○ 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

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 4
Sum,          Dec 0
```

Select one:

- a. The program will output the decimal numbers 10, 6 and 2 before ending. ✔
- b. The program will output the decimal numbers 10, 8, 6, 4, 2 and 0 before ending.
- c. The program will compute the expression 10, 8, 6, 4 and 2 before ending.
- d. The program will compute the expression 10+6+2 (i.e., 18) before ending.
- e. The program will output 4 for three consecutive times 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 4 will be subtracted from AC and the execution will continue from LoopC (due to the "Jump LoopC" instruction). This time the AC will be 6 so the evaluation of Skipcond will make the program continue from "Loop" again, this time outputing 6 first and then subtracting 4 from it. This will continue until AC becomes -2, at which point the program execution will jump to "LoopEnd" and will be halted. Thus, the program will output the values 10, 6, and 2 before halting.

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

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

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

Select one:

○ a. LOAD Y

○ b. Neither the above sequence nor any subsequence of it corresponds to a MARIE instruction.

◉ c. STORE Y   ✔ Correct

○ d. ADD Y

○ e. STORE AC+MAR

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 6
Correct
Mark 1.00 out of 1.00

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

Select one:

○ a. All components

◉ b. 1 component   ✔

○ c. 3 components

○ d. 2 components

○ e. Don't Know/No answer

Your answer is correct.

The correct answer is: 1 component

Consider the following MARIE code. The code starts at address 000: the first instruction is saved at address 000.

After the execution of this code what is the value (in decimal) stored in the OutREG register?

If,	Load X
	Subt Y
	Skipcond 400
	Jump Else
Then,	Load X
	Add Z
	Output
	Jump Endif
Else,	Load X
	Add X
	Subt Y
	Subt Z
	Output
Endif,	Halt
X,	Dec 9
Y,	Dec 5
Z,	Dec 2

Select one:

- ○ a. 18
- ⦿ b. 11 ✔
- ○ c. 7
- ○ d. 10
- ○ e. 8

This program executes the "If, then, else" statement using the Skipcond instruction. In this case, the condition in Skipcond is 01. So, the statement (if AC=0 then PC=PC+1) is evaluated and the "Else" part of the code is executed since AC equals to 4 after the execution of the first two instructions of the program. The program then continues to execute and the "Output" instruction outputs the value of OutREG and OutREG=AC and AC is X+X-Y-Z=11 and terminates at "Halt". So the answer is 11.

The correct answer is: 11

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

Select one:

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

Your answer is correct.

The correct answer is: OpCode, Address

Consider the following MARIE code. The code starts at address 000: the first instruction is saved at address 000.

After the execution of this code what is the value (in decimal) stored in the OutREG register?

```
If,      Load X
         Subt Y
         Skipcond 400
         Jump Else
Then,    Load X
         Add Z
         Output
         Jump Endif
Else,    Load X
         Subt Z
         Output
Endif,   Halt
X,       Dec 7
Y,       Dec 5
Z,       Dec 2
```

Select one:
- ○ a. 1
- ○ b. 7
- ● c. 5   ✔
- ○ d. Don't know/No answer
- ○ e. 3

This program executes the "If, then, else" statement using the Skipcond instruction. In this case, the condition in Skipcond is set to 400 and so IR[11-10] is 01. So, the statement (if AC=0 then PC=PC+1) is evaluated and the "Else" part of the code is executed since AC equals to 2. The program then continues to execute and the "Output" instruction outputs the value of OutREG and OutREG=AC and AC is X-Z=5 and terminates at "Halt". So the answer is 5.

The correct answer is: 5

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

PC ← X

Select one:

○ a.   Load X

○ b.   Don't know/No answer

○ c.   Store X

◉ d.   Jump X   ✔

○ e.   Add X

The correct answer is: Jump X

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