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 5
```

Select one:

- a. It will store the octal value 5 and terminate.
- b. It will compute and store the decimal value 5.
- c. It will output the hexadecimal value -5 and terminate.
- d. It will compute the decimal value -5, store it in Y and terminate. ✔
- 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 **2**

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. ADDI Y ✔
- b. ADD AC+Y
- c. LOADI Y
- d. There is no MARIE instruction that corresponds to the above sequence of micro operations or a subsequence of it.
- e. LOADI Y+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 **3**

Correct

Mark 1.00 out of 1.00

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

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

Select one:

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

The correct answer is: Store X

Question **4**

Correct

Mark 1.00 out of 1.00

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

Select one:

- a. 32 SR flip-flips
- b. Don't know/no answer
- c. 16 D flip-flops and 16 SR flip-flops.
- d. 64 D 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-flips connected by a bus.

The correct answer is: 32 D flip-flops

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

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

Select one:

- a. Don't know/No response
- b. ...an important hardware technology used to build processors.
- c. ...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 . ✔ This is correct.
- d. ... loop instruction in MARIE architecture.
- e. ... part of the Input/Output subsystem of the von Neumann model.

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 **7**

Correct

Mark 1.00 out of 1.00

Consider the MARIE instructions Skipcond and Clear. Which of the following CPU registers are not used in the execution of any these instructions?

Select one:

- a. MAR, MBR, InReg, OutReg and PC
- b. Don't know/No answer
- c. MAR, MBR, InReg, OutReg ✔
- d. MAR and MBR
- e. InReg, OutReg

The execution of the instruction Skipcond uses only the registers AC and PC. The execution of the instruction Clear uses only the register AC.

The correct answer is: MAR, MBR, InReg, OutReg

Question **8**

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. LOAD Y
- b. ADD Y
- c. Neither the above sequence nor any subsequence of it corresponds to a MARIE instruction.
- d. STORE Y ✔ Correct
- 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 **9**

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

The correct answer is: Add X

Question **10**

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

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

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