Introduction to Computer Science: Final Exam

January 10, 2019. 9:30 - 11:00

Name: _____

Student ID: _____

Instructions: This paper consists of 50 multiple choice questions. You have to answer all of them. Each carries two marks. Each question has only one correct option. Please put down the answer clearly next to the question number.

The information regarding the artificial CPU and the source codes of the programs for answering the questions are put in the end of the paper.

Reminder: Beware of careless mistake!

Question 1 - Question 10 are logical questions. You need to select one of the following options for your answer. Both X and Y are arguments.

(a) X is true. Y is not true.

(b) X is not true. Y is true.

(c) Both X and Y are true but X and Y have no logical implication.

(d) Both X and Y are true. X is the cause of Y (X implies Y, or Y is an implication of X).

(e) Both X and Y are not true.

Question 1

X: There was no electricity in 400 years ago.
Y: There was no computing device in 400 years ago.

Question 2

X: ENIAC is the first electronic computer made in USA.
Y: In World War II, USA used ENIAC successfully to break the encryption code that the German army was using for radio communication.

Question 3

X: Electronic logic gates were developed in the 18 century.
Y: Vacuum tube was invented in the 1900s.

Question 4

X: All logic gates can be made by NAND gates.
Y: The arithmetic logic unit (ALU) in a CPU can be made by NAND gates only.

Question 5

X In CPU, subtraction of two positive integers is implemented by using full-adders.
Y Negative number can be represented by 2's compliment formate.

Question 6

X: 'MS Office for Windows' and 'MS Office for MacOS' are the same software.
Y: 'MS Office for Windows' can be installed in MacOS computer.

Question 7

X: Apple APP Store is a platform for users to upload and sell their iOS Apps.
Y: Android phone users can buy the iOS Apps and install in their phones.

Question 8

X: The first instruction to be executed by the CPU when a computer is turned on is stored in RAM.
Y: A computer 'might not be' functioning if RAM is broken down.

Question 9

X: iOS and Android are designed to handle multitasking.
Y: One can receive phone call while he is using cell phone to watch YouTube video.

Question 10

X: An interpreter can convert 'a programming command' to machine codes.
Y: A 'C program' can be converted by an interpreter to an executable file.

Diagram for Questions 11-15

The following schematic diagram is for Question 11 to Question 15. It is a circuit consisting of two logic gates.
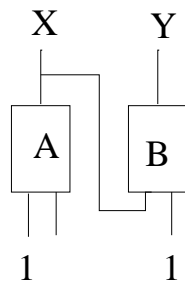
Question 11

What are the output values X and Y if A is an XOR gate, B is an AND gate and the input (from left to right) is 101.

(a) $X = 0, Y = 0$.

(b) $X = 0, Y = 1$.

(c) $X = 1, Y = 0$.

(d) $X = 1, Y = 1$.

Question 12

What are the output values X and Y if A is an OR gate, B is an OR gate and the input (from left to right) is 111.

(a) $X = 0, Y = 0$.

(b) $X = 0, Y = 1$.

(c) $X = 1, Y = 0$.

(d) $X = 1, Y = 1$.

Question 13

What are the output values X and Y if A is an AND gate, B is an XOR gate and the input (from left to right) is 101.

(a) $X = 0, Y = 0$.

(b) $X = 0, Y = 1$.

(c) $X = 1, Y = 0$.

(d) $X = 1, Y = 1$.

Question 14

What are the output values X and Y if A is an OR gate, B is an NAND gate and the input (from left to right) is 111.

(a) $X = 0, Y = 0$.

(b) $X = 0, Y = 1$.

(c) $X = 1, Y = 0$.

(d) $X = 1, Y = 1$.

Question 15

What are the output values X and Y if A is an NAND gate and B is an NAND gate and the input (from left to right) is 111.

(a) $X = 0, Y = 0$.

(b) $X = 0, Y = 1$.

(c) $X = 1, Y = 0$.

(d) $X = 1, Y = 1$.

Question 16

Which of the following software has an interpreter inside?

(i) Window OS

(ii) MacOS

(iii) Android

Answer:

(a) (i) and (ii) only.

(b) (ii) and (iii) only.

(c) (i) and (iii) only.

(d) (i), (ii) and (iii).

Question 17

Which of the following statement about the interaction between an application software and the operating system is *False*?

(a) Once an application software has a request for an operating system, it sends a request message on the service queue of the operating system.

(b) Once the operating system has completed a request, it sends the result message on the receiving queue of the application software.

(c) Normally, an application software has no right to instruct the operating system to change the priority of its request.

(d) Normally, an operating system does not change the priority of a request from any application software.

(e) Normally, an operating system will serve the requests in *first-come-first-serve* basis.

(f) None of them is false.

Question 18

How does an application software know that the service request to an operating system has completed?

(a) The application software from time to time will send a message to the operating system checking for the progress.

(b) The application software from time to time will check from its queue seeing if there is anything there.

(c) The operating system from time to time will send a message to the application software informing the progress.

(d) The operating system from time to time will check from its queue seeing if there is any *checking-for-progress* message coming.

Question 19

Which of the following statement about medium access control (MAC) is true?

(a) If a computer has detected that the medium is being in use, the computer will wait for a fixed period of time and then re-detect the medium seeing if it is in use. If the medium is not in use, it sends out the message to the medium.

(b) If a computer has detected that the medium is being in use, the computer will wait for a random period of time and then re-detect the medium seeing if it is in use. If the medium is not in use, it sends out the message to the medium.

(c) If a computer has detected that the medium is not in use, the computer will wait for a fixed period of time and then re-detect the medium seeing if it is in use. If the medium is not in use, it sends out the message to the medium.

(d) If a computer has detected that the medium is not in use, the computer will wait for a random period of time and then re-detect the medium seeing if it is in use. If the medium is not in use, it sends out the message to the medium.

Question 20

Which of the following statements about *port number* are true?

(i) Each application server (web server for instance) is usually assigned to a unique port number.

(ii) Once a message has arrived a computer, the network operating system will check the port number specified in the message and then pass the message to the corresponding application server queue.

(iii) Two different application servers, say email server and web server, can use the same port number.

Answer:

(a) (i) and (ii) only.

(b) (ii) and (iii) only.

(c) (i) and (iii) only.

(d) (i), (ii) and (iii).

Question 21

Which of the following stuffs are needed for send a file from one computer to another?

(i) Sender IP address

(ii) Receiver IP address

(iii) Port number

(iv) Session ID

(v) Packet ID

(vi) email address

Answer:

(a) (i), (ii), (iii), (iv) and (v) only.

(b) (ii), (iii), (iv) and (v) only.

(c) (ii), (iii), (iv), (v) and (vi) only.

(d) (i), (ii), (iii), (iv), (v) and (vi).

Question 22

Which of the following environments their medium access controls are essentially the same?

(i) Computer connecting in a ring structure.

(ii) Computers connecting in a bus topology.

(iii) Mobile devices and the access point.

Answer:

(a) (i) and (ii) only.

(b) (ii) and (iii) only.

(c) (i) and (iii) only.

(d) (i), (ii) and (iii).

Question 23

Suppose your cell phone (with enough battery power) has been set to the following conditions but your cell phone is not able to access www.yahoo.com. However, you can still make a phone call. Which of the following reason(s) is(are) likely the cause of this connection failure?

```
WiFi               OFF
Bluetooth          OFF
Cellular           ON
Personal Hotspot   OFF
Carrier            ON
```

(i) The WiFi option is OFF.

(ii) The DNS in the telecom firm is down.

(iii) Web server www.yahoo.com is down.

Answer:

(a) (i) and (ii) only.

(b) (ii) and (iii) only.

(c) (i) and (iii) only.

(d) (i), (ii) and (iii).

Question 24

If we would like to show the following text on a webpage, which of the following codes should be added?

statistical analysis.

In the HTML file, what would be the correct coding for it?

(i) `<b><i>statistical analysis</i></b>`

(ii) `<i><b>statistical analysis<b></i>`

(iii) `<i><b>statistical analysis</i></b>`

Answer:

(a) (i) and (ii) only.

(b) (ii) and (iii) only.

(c) (i) and (iii) only.

(d) (i), (ii) and (iii).

Question 25

Which of the following commands should be put in a file 'index.html' and function correctly? Here, the file "john2009.jpg" is located in the same directory of 'index.html'. The file "poker01.cpp" is located in the folder called 'misc' and this folder is located in the same directory as the one for "index.html".

(i) `<a href="www.nchu.edu.tw">NCHU</a>`

(ii) `<a href="misc/john2009.jpg">John</a>`

(iii) `<a href="misc/poker01.cpp">Poker</a>`

Answer:

(a) (i) and (ii) only.

(b) (ii) and (iii) only.

(c) (i) and (iii) only.

(d) (i), (ii) and (iii).

Question 26

Here is a segment of HTML code.

```
<table>
<tr> <td>Instructor:</td>
     <td>John Sum</td> </tr>
<tr> <td>Office:</td>
     <td>Room 821</td></tr>
<tr> <td>Time:</td>
     <td>Friday 09:10-12:00 </td> </tr>
<tr> <td>Classroom:</td>
     <td>CS121</td> </tr>
</table>
```

Once the above program segment is interpreted, what will you see on the browser.

(a) Instructor: John Sum
    Office: Room 821
    Time: Friday 09:10-12:00
    Classroom: CS121

(b) Instructor:John Sum
    Office: Room 821
    Time: Friday 09:10-12:00
    Classroom: CS121

(c) Instructor: John Sum
    Office: Room 821
    Time: Friday 09:10-12:00
    Classroom: CS121

(d) Instructor:John Sum
    Office:Room 821
    Time:Friday 09:10-12:00
    Classroom:CS121

Question 27

John encrypts a letter by using Mary's public key and then sends it to Mary. Somehow Peter gets the letter and destroys it. Besides, Peter acts on behalf of John to prepare another letter and encrypts it by using Mary's public key. Finally, Mary receives the letter from Peter. Which of the following will happen?

(a) Mary can read the letter and identify that it is not from John.

(b) Mary can read the letter and identify that it is from Peter.

(c) Mary can read the letter but she fails to identify the sender of the letter.

(d) None of the above.

Question 28

John encrypts a letter by using his own private key and Mary's public key. Then, the letter is sent to Mary. Somehow Peter gets the letter and destroys it. Besides, Peter acts on behalf of John to prepare another letter and encrypts it by using his own private key and Mary's public key. Finally, Mary receives the letter from Peter. Which of the followings will happen?

(a) Mary can read the letter and identify that it is from Peter.

(b) Mary cannot read the letter but she can identify it is from Peter.

(c) Mary can read the letter but fail to identify the sender of the letter.

(d) Mary cannot read the letter and fail to identify the sender of the letter.

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Question 29

Which of the following methods is NOT a correct method for encryption?

(a) John encrypts the letter by using his public key. While Mary has received the message, she decrypts the message by using John's public key.

(b) John encrypts the letter by using Mary's public key. While Mary has received the message, she decrypts the message by using her private key.

(c) John encrypts the letter by using Mary's private key and then by using his public key. While Mary has received the message, she decrypts the message first by using John's private key and then by using her public key.

(d) John encrypts the letter by using Mary's public key and then by using his private key. While Mary has received the message, she decrypts the message first by using John's public key and then by using her private key.

Question 30

A CEO would like to send an official announcement to his colleagues. What he can do to let his colleagues to authenticate that the announcement is from him?

(a) He can encrypt the message by using his private key.

(b) He can encrypt the message by using his public key.

(c) He can encrypt the message first by using his private key and then re-encrypt the cipher text by using his public key.

(c) He can encrypt the message first by using his public key and then re-encrypt the cipher text by using his private key.

Question 31

Which of the following key(s) is(are) needed for establishing a SSL between computer A and computer B?

(i) A's public key

(ii) A's private key

(iii) B's public key

(iv) B's private key

(v) Secure key

Answer:

(a) (i), (iv) and (v) only.

(b) (ii), (iii) and (v) only.

(c) (i), (ii), (iii) and (iv) only.

(d) (i), (ii), (iii), (iv) and (v).

(e) (v) only.

Question 32

Here is the access matrix for users John, Mary, Peter, application system A, and application system B.

	F1	F2	F3	AS1	AS2
John	orw	rw		e	e
Mary	r	w	orw	e	
Peter		orw	rw		e
AS A	rw	rw			
AS B		rw	rw		

o: owner, r: read, w: write, e: execute

Which of the following information leakage(s) could happen?

(i) Information in F1 could be leaked to Peter.

(ii) Information in F2 could be leaked to Mary.

(iii) Information in F3 could be leaked to John.

Answer:

(a) (i) and (ii) only.

(b) (ii) and (iii) only.

(c) (i) and (iii) only.

(d) (i), (ii) and (iii).

Question 33

Refer to the artificial CPU and its commands, what will be the content of $M4$ if the following commands are executed?

```
DEF M1 1
DEF M2 2
DEF M3 5

MOV IA M1
IF IA == 0
    MOV IA M2
    MOV IB M3
    ADD IA IB
    MOV M4 OUT
ELSE
    MOV IA M1
    MOV IB M3
    MUL IA IB
    MOV M4 OUT
ENDIF
```

(a) 2.

(b) 7.

(c) 5.

(d) 0.

Question 34

What will be the content of $M4$ if the following program segment is executed?

```
DEF M1 16
DEF M2 22
DEF M3 10
MOV IA M1
MOV IB M2
CMP IA IB
CMP IA IB
MOV M4 OUT
MOV IA M2
MOV IB M3
CMP IA IB
CMP IA IB
MOV IA OUT
MOV IB M4
ADD IA IB
MOV M4 OUT
```

(a) 28.

(b) 30.

(c) 32.

(d) 34.

Question 35

Refer to the artificial CPU and its commands, what will be the content of $M4$ if the following commands are executed?

```
DEF M1 0
DEF M2 2
DEF M3 5

MOV IA M1
IF IA == 0
    MOV IA M2
    SHL IA 00000100
    MOV IA OUT
    MOV IB M2
    ADD IA IB
    MOV M4 OUT
ELSE
    MOV IA M3
    SHL IA 00000100
    MOV IA OUT
    MOV IB M3
    ADD IA IB
    MOV M4 OUT
ENDIF
```

(a) 4.

(b) 6.

(c) 8.

(d) 10.

Question 36

Given that there are five memories M1, M2, M3, M4 and M5. Here is the program segment to instruct the circuit.

```
----------------
MOV IA M1
MOV IB M2
MUL IA IB
MOV IA OUT
MOV IB M3
MUL IA IB
```

7

```
MOV IA OUT
MOV IB M4
SUB IA IB
MOV M5 OUT
----------------
```

which of the following mathematical equation is identical to the operation of the following program segment?

(a) $M5 = M4 - M1 \times M2 \times M3$.

(b) $M5 = M4 - (M1 + M2) \times M3$

(c) $M5 = M1 \times M2 \times M3 - M4$.

(d) $M5 = (M1 + M2) \times M3 - M4$.

Question 37

In C language, **rand()** is a command used for generating random number. Which of the following statements about this random number generator function is correct?

(a) Once the command "rand()%100" is executed, it will generate an random integer in between 1 to 100.

(b) Once the command "rand()%100" is executed, it will generate an random integer in between 0 to 99.

(c) Once the command "rand()%100" is executed, it will generate an random decimal number in between 1 to 100.

(d) Once the command "rand()%100" is executed, it will generate an random decimal number in between 0 to 99.

Question 49

If the following C program segment is executed, what will you see on the screen?

```
i=0;
While (i<=2)
{ printf("*");
  i = i+1;
}
printf("%d", i);
```

(a) **2
c:\>

(b) **3
c:\>

(c) **2

c:\>

(d) **3

c:\>

Question 39

What will you see on the console if the following program segment is executed?

```
#include<stdio.h>
#include<stdlib.h>

main()
{
int i;

for(i=0; i<4; i++)
    printf("%d ", i%3);
printf("%d", i);
}
```

(a) 0 1 2 3
c:\>

(b) 0 1 2 3

c:\>

(c) 0 1 2 3 4
c:\>

(d) 0 1 2 3 4

c:\>

Question 40

Refer to Program A. What is the content of "argv[0]" if the following command is typed?

```
c:\>winnerloser w 2 3 8 4 7 9 11 2 1 33
```

(a) winnerloser

(b) w

(c) 2

(d) 3

(e) 12.

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Question 41

Refer to Program A. What is the value of "argc" if the following command is typed?

```
c:\>winnerloser w 2 3 8 4 7 9 11 2 1 33
```

(a) 10

(b) 11

(c) 12

(d) 13

(e) None of the above.

Question 42

Refer to Program A. What will you see if the following command is typed?

```
c:\>winnerloser w 2 3 8 4 7 9 11 2 1 33
```

(a) The value of the 2 winner is 11.
    c:\>

(b) The value of the 3 winner is 9.
    c:\>

(c) The value of the 2 looser is 2.
    c:\>

(d) The value of the 3 looser is 2.
    c:\>

(e) None of the above.

Question 43

Refer to Program A. What will you see if the following command is typed?

```
c:\>winnerloser l 2 3 8 4 7 9 11 2 1 33
```

(a) The value of the 2 winner is 11.
    c:\>

(b) The value of the 3 winner is 9.
    c:\>

(c) The value of the 2 looser is 2.
    c:\>

(d) The value of the 3 looser is 2.
    c:\>

(e) None of the above.

Question 44

Refer to Program A. What will you see if the following command is typed?

```
c:\>winnerloser w 10 3 8 4 7 9 11 2 1 33
```

(a) The value of the 2 winner is 11.
    c:\>

(b) The value of the 3 winner is 9.
    c:\>

(c) The value of the 2 looser is 2.
    c:\>

(d) The value of the 3 looser is 2.
    c:\>

(e) None of the above.

Question 45

Refer to Program A. What will you see if the following command is typed?

```
c:\>winnerloser l 10 3 8 4 7 9 11 2 1 33
```

(a) The value of the 2 winner is 11.
    c:\>

(b) The value of the 3 winner is 9.
    c:\>

(c) The value of the 2 looser is 2.
    c:\>

(d) The value of the 3 looser is 2.
    c:\>

(e) None of the above.

Question 46

Refer to Program B. If your option of sorting style is "d" the the numbers entered are "4 5 2 1 6", what will you see below the numbers you entered?

(a) The sorted numbers are 1 2 4 5 6.
    c:\>

(b) The sorted numbers are 1 2 4 5 6.

    c:\>

(c) `The sorted numbers are 6 5 4 2 1.`
   `c:\>`

(d) `The sorted numbers are 6 5 4 2 1.`

   `c:\>`

(e) None of the above.

Question 47

Refer to Program B. If your option of sorting style is "a" the the numbers entered are "4 5 2 1 6", what will you see below the numbers you entered?

(a) `The sorted numbers are 1 2 4 5 6.`
   `c:\>`

(b) `The sorted numbers are 1 2 4 5 6.`

   `c:\>`

(c) `The sorted numbers are 6 5 4 2 1.`
   `c:\>`

(d) `The sorted numbers are 6 5 4 2 1.`

   `c:\>`

(e) None of the above.

Question 48

Refer to Program B. If your option of sorting style is "r" the the numbers entered are "4 5 2 1 6", what will you see below the numbers you entered?

(a) `The sorted numbers are 1 2 4 5 6.`
   `c:\>`

(b) `The sorted numbers are 6 5 4 2 1.`
   `c:\>`

(c) `The sorted numbers are 1 2 4 5 6.`

   `c:\>`

(d) `The sorted numbers are 6 5 4 2 1.`

   `c:\>`

(e) None of the above.

Question 49

Refer to Program C. Which number is assigned to "Club 8" during the initialization step?

(a) 7.

(b) 20.

(c) 33.

(d) 46.

Question 50

Refer to Program C. After executing the program 'poker02.exe', the following results are displayed on the screen.

`Here are the card.`
`Player 1: S10 S11 S12 S13`
`Player 2: D10 D11 D12 D13`

`c:\>`

If the program 'poker02.exe' is re-executed, what will you see?

(a) The same results.

(b) `Here are the card.`
   `Player 1: S 1 S 2 S 3 S 4`
   `Player 2: D 1 D 2 D 3 D 4`

   `c:\>`

(c) `Here are the card.`
   `Player 1: C 1 C 2 C 3 C 4`
   `Player 2: H 1 H 2 H 3 H 4`

   `c:\>`

(b) No one knows, as the cards are re-shuffled with a new set of random numbers.

APPENDIX

In this appendix, it includes the information about the artificial CPU and the source codes of five programs. Please read them carefully!

Artificial CPU

Below is a simple circuit. It consists of a **memory** with 16 memory spaces (from M1 to M16), an **ALU block**, 2 **input registers** (IA and IB) and one **output register** (OUT). M1 to M16, IA, IB and OUT are all 8 bits long. Numbers are represented in *2's compliment* format.
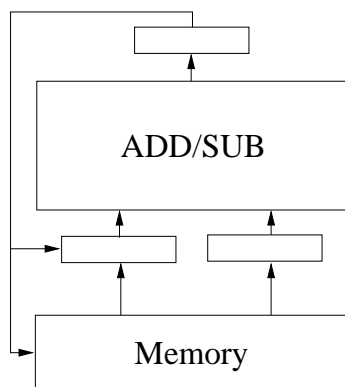
Eleven commands (MOV, ADD, SUB, MUL, DIV, CMP, SHL, SHR, DEF, MSK and IF) are provided for instructing the above circuit. The syntax and the descriptions of these commands are depicted in Table 1.

Notes on CPU Commands

1. For the "CMP" command, if $X = 0110$ and $Y = 1101$, $OUT = 1011$.

2. For "SHL" and "SHR" commands, the content of Y can only be one of the following.

Y	Meaning
10000000	(Shift 7 bits)
01000000	(Shift 6 bits)
00100000	(Shift 5 bits)
00010000	(Shift 4 bits)
00001000	(Shift 3 bits)
00000100	(Shift 2 bits)
00000010	(Shift 1 bits)
00000001	(No shift)

Table 1: Commands for using the CPU.

Syntax	Description
MOV X Y	Copy the content of Y to X
ADD X Y	$OUT = X + Y$.
SUB X Y	$OUT = X - Y$.
MUL X Y	$OUT = X \times Y$.
DIV X Y	$OUT = X/Y$.
CMP X Y	$OUT = b_1 b_2 b_3 b_4 b_5 b_6 b_7 b_8$.
	$b_i = 0$ if $X_i = Y_i$.
	$b_i = 1$ if $X_i \neq Y_i$.
SHL X Y	OUT is the content of X shifting left Y bits.
SHR X Y	OUT is the content of X shifting right Y bits.
DEF X N	Define X as the number N.
MSK X M	Mask the value of X by M.
IF ELSE	Condition statement.

For example, if

$$X = 00011000, Y = 00000100,$$

the OUT of "SHL X Y" is 01100000 and the OUT of "SHR X Y" is 00000110.

3. For the "DEF" command, N must be a number in *decimal* form. X can only be a memory location. "DEF" command is not applicable for assigning values to a register. It is used to assign a value to a memory location. For example, "DEF M1 12" means that memory location $M1$ will be assigned with a value 12. Therefore, $M1 = 00001100$.

4. For the "MSK" command, it is used for masking a register (either IA or IB) by the mask M (in binary). The mask must be 8 bits long.

   Suppose that the content of IA and M are defined as follows :

   $$IA = 01001001, M = 11110000.$$

   Then, the output OUT will be "01000000". The last four bits are masked. Here is an example.

```
------------------------
DEF M1 45
```

```
   MOV IA M1
   MSK IA 00001111
   MOV M2 OUT
   ------------------------
```

Initially, $M1$ is assigned with value 45. In binary form, the content reads "00101101". Thus, the output OUT is "00001101".

5. The "IF-ELSE" command is an advanced level command. It is for conditional statement. Once it is executed, the CPU will performs multiple steps in order to make it works. You do not need to know the detail how it works. In term of its usage, it is simple. Here is an example.

```
   ------------------------
   DEF M1 1
   DEF M2 2
   DEF M3 1

   MOV IA M1
   IF IA == 0
      MOV IA M2
      MOV IB M3
      ADD IA IB
      MOV M4 OUT
   ELSE
      MOV IA M1
      ADD IB M2
      MOV M4 OUT
   ENDIF
   ------------------------
```

Command "IF" checks if the content of IA is identical to "0". If it is, it will perform $M2+M3$ and output the result to $M4$. Otherwise, it will perform $M1+M2$ and output the result to $M4$.

```
   ------------------------
   DEF M1 1
   DEF M2 2
   DEF M3 1

   MOV IA M1
   IF IA == 0
      MOV IA M2
      MOV IB M3
      ADD IA IB
```

```
      MOV M4 OUT
   ENDIF
   ------------------------
```

In this example, the CPU performs $M2+M3$ only if IA is zero. Otherwise, it performs nothing.

6. For the "IF-ELSE" command, the following conditions are allowed for you to define. Here NUM must be stated in decimal form but not in binary.

```
   ------------------------
   IA == NUM
   IA > NUM
   IA >= NUM
   IA < NUM
   IA <= NUM
   ------------------------
```

Program A

The filename of the following program is "winnerloser.cpp".

```
/************************************************************************
winnerloser.cpp
************************************************************************/
#include<stdio.h>
#include<stdlib.h>

main(int argc, char *argv[])
{
    int A[256]; /* Define integer array. */
    int i,j; /* Define indices. */
    int tmp; /* Define dummy variable for sorting. */
    char Opt = 'c';
    int SNUM, POS;

    /* Step 1: Read input from the command line. */
    SNUM = argc - 3;
    Opt = argv[1][0];
    POS = atoi(argv[2]);

    if (POS <= SNUM)
    {
      if((Opt == 'w')||(Opt == 'l'))
      {
        for(i = 0; i<SNUM; i++)
            A[i] = atoi(argv[i+3]);

        /* Step 2: Sorting the numbers */
        if(Opt == 'l')
        {
          for(i=0; i<SNUM-1; i++)
          for(j=0; j<SNUM-i-1; j++)
          {
                if(A[j] > A[j+1])
                {
                tmp = A[j];
                A[j] = A[j+1];
                A[j+1] = tmp;
                }
          }
          printf("The value of the %d loser is %d.", POS, A[POS-1]);
        }
        if(Opt == 'w')
        {
          for(i=0; i<SNUM-1; i++)
          for(j=0; j<SNUM-i-1; j++)
          {
                if(A[j] < A[j+1])
                {
                tmp = A[j];
                A[j] = A[j+1];
                A[j+1] = tmp;
                }
          }
          printf("The value of the %d winner is %d.", POS, A[POS-1]);
        }
```

```
    }
    else
        printf("Something wrong in your inputs.");
    }
    else
        printf("The position %d is larger than %d.", POS, SNUM);
}
```

Program B

The filename of the following program is "bubblesort03.cpp".

```c
#include<stdio.h>
main()
{
    int A[5], i, j, tmp;
    char OPT[8];   char Opt = 'c';

    printf("This program demonstrates how to do sorting.\n\n");
    while((Opt != 'a')&&(Opt != 'd'))
    {
    printf("Select a sorting style, 'a' for ascending and 'd' for descending.\n");
    printf("Option : ");
    scanf("%s", OPT);
    Opt = OPT[0];
    }
    printf("\n");
    printf("Please enter five numbers.\n");

    for(i=0; i<5; i++)
    {
    printf("Enter the %d number: ", i+1);
    scanf("%d", &A[i]);
    }

    if(Opt == 'a')
        for(i=0; i<4; i++)
        for(j=0; j<4-i; j++)
                if(A[j] > A[j+1])
                {
                tmp = A[j];
                A[j] = A[j+1];
                A[j+1] = tmp;
                }
        printf("The sorted numbers are");
        for(i=0; i<5; i++)
            printf(" %d", A[i]);
        printf(".");
    else
        for(i=0; i<4; i++)
        for(j=0; j<4-i; j++)
                if(A[j] < A[j+1])
                {
                tmp = A[j];
                A[j] = A[j+1];
                A[j+1] = tmp;
                }
        printf("The sorted numbers are");
        for(i=0; i<5; i++)
            printf(" %d", A[i]);
        printf(".");
}
```

Program C

The filename of the following program is "poker02.cpp".

```
/**************************************************
poker02.cpp

Note that srand(time(NULL)) command has been added
**************************************************/
#include<stdio.h>
#include<stdlib.h>
#include<time.h>

main()
{
        int MAX = 10000;
        int RANGE = 52;
        int CARD[52];
        int PLAYER[2][5];
        int HAND, NUMBER;
        int i, j;
        int tmp, tmp1, tmp2;

        /* Step 1: Card Initialization */
        for(i=0; i<RANGE; i++)
          CARD[i] = i;

        /* Step 2: Card shuffling */
        srand(time(NULL));
        printf("The card are being shuffled now.\n");
        for(i=0; i<MAX; i++)
        {
                tmp1 = rand() % RANGE;
                tmp2 = rand() % RANGE;
                tmp = CARD[tmp1];
                CARD[tmp1] = CARD[tmp2];
                CARD[tmp2] = tmp;
        }

        /* Step 3: Card Assignment */
        for(i=0; i<2; i++)
          for(j=0; j<5; j++)
            PLAYER[i][j] = CARD[i*4+j];

        printf("Here are the cards.\n");
        for(i=0; i<2; i++)
        {
            printf("Player %2d: ", i+1);
            for(j=0; j<5; j++)
              {
                tmp = PLAYER[i][j];
                HAND = tmp/13;
                NUMBER = tmp % 13;

                switch ( HAND )
                {
                        case 0: printf("S%2d  ", NUMBER+1); break;
                        case 1: printf("H%2d  ", NUMBER+1); break;
                        case 2: printf("C%2d  ", NUMBER+1); break;
```

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```
                    case 3: printf("D%2d  ", NUMBER+1); break;
            }
        }
        printf("\n");
    }
    /* END */
}
```