

Introduction to Computer Science: Mid-Term Exam

November 8, 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.

For the Question 1 to Question 10, you need to select one of the following options for your answer.

- (a) Both X and Y are false.
- (b) X is true. Y is false.
- (c) X is false. Y is true.
- (d) Both X and Y are true. But X is not the cause of Y .
- (e) Both X and Y are true. X is the cause of Y .
- (f) Both X and Y are true. Y is the cause of X .

Question 1

X : UK is leading the worldwide computer industry today.

Y : US made the first commercial computer in the world.

Question 2

X : The first generation Lyon Electronic Office (LEO) computer was made of vacuum tubes.

Y : Vacuum tube was invented by John Ambrose Fleming in 1900s.

Question 3

X : NASA was able to launch Apollo project and landed the first human on the moon in the late 1960s.

Y : Microprocessor was invented in the 1960s.

Question 4

X : The first IBM personal computer was expensive and not user-friendly.

Y : The sales of the first IBM personal computer was failed to meet the market.

Question 5

X : It is not possible to run Safari in MacOS platform.

Y : Safari is a browser developed only for iOS.

Question 6

X : Mouse was co-invented by Xerox and Apple.

Y : Apple released the first commercially successful computer with graphical user interface (GUI) for commanding the operating system.

Question 7

X : Logic gate did not appear in the early 20 century.

Y : There was no computer in the early 20 century.

Question 8

X : NOT, AND, OR, NOR and XOR gates can be implemented by NAND gates only.

Y : Any digital logic circuit can be implemented by NAND gates only.

Question 9

X : Different types of file stored in a computer have different file extensions, like '.exe' and '.jpg'.

Y : The operating system is able to recognize a file if it is an executable file or a document file. The application system is able to recognize if the file is with the accepted format for the system to process.

Question 10

X: We can use an android phone to download a document and watch YouTube video at the same time.

Y: Android is an operating system that can handle multitasking.

Question 11

Which of the following persons proposed the first conceptual model of computer?

- (a) Charles Babbage
- (b) Alan Turing
- (c) John von Neumann
- (d) John Sum

Question 12

Which of the following statement is true?

- (a) Computer was invented long before WWII.
- (b) Computer was invented just before WWII.
- (c) Computer was invented during WWII.
- (d) Computer was invented after WWII.

Question 13

In US, which company successfully built the first commercial computer?

- (a) Lyon
- (b) LEO
- (c) Mauchly & Eckert Company
- (d) Remington Rand

Question 14

Which of the following statement about information system is true?

- (a) An information system is a set of interrelated components that process, store and distribute information to support decision making and control in an organization.
- (b) An information system is a set of interrelated components that collect, process and store information to support decision making and control in an organization.

(c) An information system is a set of interrelated components that collect, process and distribute information to support decision making and control in an organization.

(d) An information system is a set of interrelated components that collect, process, store and distribute information to make decisions and control in an organization.

Question 15

Which of the following statement(s) is(are) true?

- (i) Without electricity, it is not possible to have an information system.
- (ii) Without computer, it is not possible to have an information system.
- (iii) The function of an information system is determined by the business operations.

Answer:

- (a) (i) only
- (b) (i) and (ii) only
- (c) (iii) only
- (d) (ii) and (iii) only

Question 16

In term of memory size, which of the following order is correct?

- (a) Cache > Hard Disk > RAM > Register
- (b) Cache < Hard Disk < RAM < Register
- (c) Register < Cache < RAM < Hard Disk
- (d) Register > Cache > RAM > Hard Disk

Question 17

In accordance with the level of difficulties, what should be the correct ranking of the following skills.

- (a) Using WORD > Design and Develop WORD > Design and Develop Window
- (b) Using Window > Design and Develop Window > Using WORD
- (c) Design and Develop Window > Design and Develop WORD > Using WORD
- (d) None of the above.

Question 18

Which of the following dotcoms are market makers?

- (i) UBER
- (ii) AirBNB
- (iii) Apple AppStore

Answer:

- (a) (i) and (ii) only.
- (b) (ii) and (iii) only.
- (c) (i) and (iii) only.
- (d) (i), (ii) and (iii).

Question 19

In an e-marketplace, like eBay, who are the customers of this e-marketplace.

- (a) The people who buy things via this platform.
- (b) The people who sell things via this platform.
- (c) Both buyers and sellers who buy and sell things via this platform.
- (d) Both buyers and sellers are not the customers of the e-marketplace.

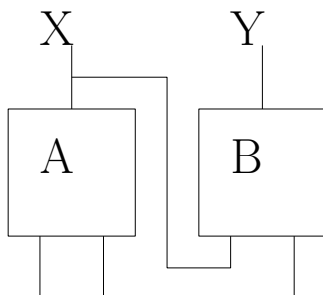
Question 20

Which of the following statement is true?

- (a) CPU and GPU are both CISC processors.
- (b) CPU and GPU are both RISC processors.
- (c) CPU is a CISC processor and GPU is a RISC processor.
- (d) CPU is a RISC processor and GPU is a CISC processor.

Diagram for Questions 21-26

The following schematic diagram is for Question 21 to Question 26. It is a circuit consisting of two logic gates.



Question 21

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 22

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 23

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 24

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 25

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 26

What are the output values X and Y if A is an OR gate, B is an AND gate and the input (from left to right) is $1x1$? Here, 'x' means that the second input is unknown.

- (a) $X = 0, Y = 0$.
- (b) $X = 0, Y = 1$.
- (c) $X = 1, Y = 0$.
- (d) $X = 1, Y = 1$.

Question 27

The truth table of an half adder is shown below.

A	B	C	D
0	0	0	0
0	1	0	1
1	0	0	1
1	1	1	0

The implementation of this half adder can be done by two logic gates, say X and Y . Logic gate X is with A and B as input and C as output, while logic gate Y is with A and B as input and D as output. What should logic gates X and Y are?

- (a) X is a OR gate, while Y is an AND gate.
- (b) X is a XOR gate, while Y is an AND gate.
- (c) X is a AND gate, while Y is an OR gate.
- (d) X is a AND gate, while Y is an XOR gate.

Question 28

What is the maximum number that can be represented by using **16-bit unsigned integer number**?

- (a) $2^{16} - 1$
- (b) $2^{15} - 1$
- (c) $1 - 2^{16}$
- (d) $1 - 2^{15}$

Question 29

What is the minimum number that can be represented by using **16-bit 2'S complement integer**?

- (a) $2^{16} - 1$
- (b) $2^{15} - 1$
- (c) $1 - 2^{16}$
- (d) $1 - 2^{15}$

Question 30

What is the value of the **unsigned integer** '1000000000000000' in decimal form?

- (a) 2^{17} .
- (b) 2^{16} .
- (c) 2^{15} .
- (d) 0.

Question 31

Convert -5000_{10} into **16-bit 2'S complement integer formate** and then convert this binary bit patterns in hexadecimal form.

- (a) $EC78$.
- (b) $EC76$.
- (c) $EA78$.
- (d) $EA76$.

Question 32

Given that the format of a binary number is represented in the following **16-bit signed magnitude fixed-point format**.

$$\begin{aligned} \text{No.} &= sxxxxxyyyyyyyyyy \\ &= (-1)^{1-s}xxxx.yyyyyyyyyy \end{aligned}$$

In other words, there is one sign bit, five integer bits and 10 fractional bits.

Convert 11.375_{10} into the above format.

- (a) 0101101100000000
- (b) 0010110110000000
- (c) 0101101100000000
- (d) 1011011000000000

Question 33

Given that the format of a binary number is represented in the following **16-bit 2'S complement fixed-point format** with 10 fractional bits. Convert -7.1875_{10} into the above format.

- (a) 1110001100111111
- (b) 0111000110011111
- (c) 1110001101000000
- (d) 0111000110100000

Question 34

Given that the format of a binary number is represented in the following **IEEE 16-bit signed magnitude floating-point format**.

$$\text{No.} = sxxxxxyyyyyyyyyy,$$

where s is the sign bit, the 2nd to the 6th bits are for exponent with bias 15, and the last ten bits are for significant.

Given that the bit pattern of a number is '0011111000000000'. What is this value in decimal?

- (a) 0.5
- (b) 1.5
- (c) -0.5
- (d) -1.5

Question 35

Given that the format of a binary number is represented in the following **IEEE 16-bit signed magnitude floating-point format**.

$$\text{No.} = sxxxxxyyyyyyyyyy,$$

where s is the sign bit, the 2nd to the 6th bits are for exponent with bias 15, and the last ten bits are for significant.

Given that the bit pattern of a number is '0000001000000000'. What is this value in decimal?

- (a) 0.5×2^{-15}
- (b) 1.5×2^{-15}
- (c) 0.5×2^{-14}
- (d) 1.5×2^{-14}

Question 36

With reference to ASCII code, what is the coding of the function key 'Cancel' in binary formate?

- (a) 00010010
- (b) 10010000
- (c) 00010100
- (d) 00011000

Question 37

With reference to ASCII code, what is the correct coding in hexadecimal form for the message 'John Sum'?

- (a) 4A4F484E2053554D
- (b) 4A6F686E2053756D
- (c) 6A6F686E2073756D
- (d) 4A6F686E2053554D

Question 38

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 39

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 40

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 41

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
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 42

Three numbers have been stored in $M1$, $M2$ and $M3$. Which of the following program segments can correctly give the output of the following formulae?

$$M4 = M1 + M2 \times M3.$$

- (a) -----

```

MOV IA M1
MOV IB M2
MUL IA IB
MOV IA OUT
MOV IB M3
ADD IA IB
MOV M4 OUT
-----

```
- (b) -----

```

MOV IA M1
MOV IB M2
ADD IA IB
MOV IA OUT
MOV IB M3
MUL IA IB
MOV M4 OUT
-----

```
- (c) -----

```

MOV IA M2
MOV IB M3
MUL IA IB
MOV IA OUT
MOV IB M1
ADD IA IB
MOV M4 OUT
-----

```
- (d) -----

```

MOV IA M2
MOV IB M3

```

```

ADD IA IB
MOV IA OUT
MOV IB M1
MUL IA IB
MOV M4 OUT
-----

```

Question 43

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

```

-----
MOV IA M1
SUB IA IB
MOV IB M2
MUL IA IB
ADD IA IB
MOV M5 OUT
-----

```

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

- (a) $M5 = M1 \times M2 + M2$.
- (b) $M5 = M1 \times M2 + M1$
- (c) $M5 = M1 + M2$.
- (d) None of the above.

Question 44

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.nchu.edu.tw. However, you can still make a phone call. Which of the following is likely the cause of this connection failure?

```

WiFi           ON
Bluetooth     OFF
Cellular      ON
Personal Hotspot OFF
Carrier       ON

```

- (a) There is no available WiFi around.
- (b) Personal Hotspot is OFF.
- (c) Bluetooth is OFF.
- (d) Web server www.nchu.edu.tw is down.

Question 45

Suppose your cell phone (with enough battery power) has been set to the following conditions.

```

WiFi           OFF
Bluetooth     OFF
Cellular      OFF
Personal Hotspot OFF
Carrier       ON

```

What can you do with your cell phone?

- (i) Take photo.
- (ii) Make a phone call.
- (iii) Access Internet.

Answer:

- (a) (i) and (ii) only.
- (b) (ii) and (iii) only.
- (c) (i) and (iii) only.
- (d) (i), (ii) and (iii).

Question 46

In which device, the first instruction to be executed by the CPU is stored?

- (a) Hard disk.
- (b) RAM.
- (c) CPU cache.
- (d) BIOS.

Question 47

Which of the following statement(s) is(are) true?

- (i) File allocation table (FAT) lists the starting locations of the files that have not been deleted.
- (ii) Once a file has been commanded to delete, its filename and starting memory location will be removed in the FAT.
- (iii) Once a file has been commanded to delete, its content in the main memory will be erased.

Answer:

- (a) (i) and (ii) only.
- (b) (ii) and (iii) only.
- (c) (i) and (iii) only.
- (d) (i), (ii) and (iii).

Question 48

Which of the following statement(s) is(are) true?

- (i) Operating system serves all the application systems in the use of the network communication card in a computer.
- (ii) Operating system serves all the application systems in the use of the CPU in a computer.
- (iii) Operating system serves all the application systems in the use of the memory in a computer.

- (a) (i) and (ii) only.
- (b) (ii) and (iii) only.
- (c) (i) and (iii) only.
- (d) (i), (ii) and (iii).

Answer:

- (a) (i) and (ii) only.
- (b) (ii) and (iii) only.
- (c) (i) and (iii) only.
- (d) (i), (ii) and (iii).

Question 49

For each computer which allows multiple-user access, there must have a super account. It is sometime called 'System' and sometimes called 'Administration'. Which of the following statement(s) is(are) true for this super account?

- (i) The super account is able to read, write and delete any file in a computer.
- (ii) The super account is able to terminate any process running in a computer.
- (iii) The super account is able to access the resources of other computers which are connected to it.

Answer:

- (a) (i) and (ii) only.
- (b) (ii) and (iii) only.
- (c) (i) and (iii) only.
- (d) (i), (ii) and (iii).

Question 50

Which of the following devices need device drivers once they have been connected to the computer for use?

- (i) Hard disk.
- (ii) Laser printer.
- (iii) Keyboard.

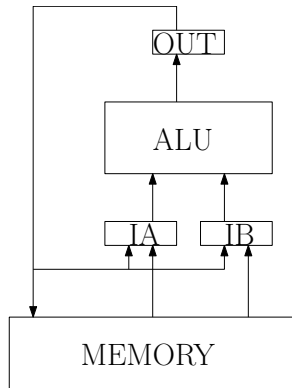
Answer:

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.

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	$OUT = b_1b_2b_3b_4b_5b_6b_7b_8$. $b_i = 0$ 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.

Notes on CPU Commands

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

For example, if

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

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

- 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, $M1 = 00001100$.
- 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".

- 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.

- 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
-----

```