

# Introduction to Computer Science: Mid-Term Exam

November 17, 2017. 9:30 - 11:00

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**Student ID:** \_\_\_\_\_

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**Instructions:** This paper consists of 50 multiple choice questions. Each carries 2 marks. You have to answer all of them. For each question, there is only ONE correct answer. Please circle your answer by using either blue or black ball pen. You can also put the answer next to the question number. But, please make sure that your handwriting is clear enough. Otherwise, the marker might miss-mark. Using dictionary and calculator during examination is allowed.

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## Question 1

Thomas Edison invented the vacuum tubes. So, the first electronic computer was invented in the earlier 20 century.

- (a) The first argument is true. The second one is false.
- (b) The first argument is false. The second one is true.
- (c) Both arguments are true but the first argument is not the cause of the second argument.
- (d) Both arguments are true and the first argument is the cause of the second argument.

## Question 2

Charles Babbage invented the first mechanical computer. So, UK made the first commercial computer in the middle of 20 century.

- (a) The first argument is true. The second one is false.

- (b) The first argument is false. The second one is true.

- (c) Both arguments are true but the first argument is not the cause of the second argument.

- (d) Both arguments are true and the first argument is the cause of the second argument.

## Question 3

Alan Turing built the first computer for the UK government. Alan Turing found a method to break the encryption code of all the Germany radio messages.

- (a) The first argument is true. The second one is false.

- (b) The first argument is false. The second one is true.

- (c) Both arguments are true but the first argument is not the cause of the second argument.

- (d) Both arguments are true and the first argument is the cause of the second argument.

## Question 4

The first mouse was invented by the engineer in Xerox. Steve Job made use of this new technology in developing the Mackintosh personal computer.

- (a) The first argument is true. The second one is false.

- (b) The first argument is false. The second one is true.

- (c) Both arguments are true but the first argument is not the cause of the second argument.
- (d) Both arguments are true and the first argument is the cause of the second argument.

### Question 5

Buyers buy things over the Alibaba platform. So, buyers are the customers of Alibaba.

- (a) The first argument is true. The second one is false.
- (b) The first argument is false. The second one is true.
- (c) Both arguments are true but the first argument is not the cause of the second argument.
- (d) Both arguments are true and the first argument is the cause of the second argument.

### Question 6

Buyers buy things over the ZARA (a fashion retailing firm) online shopping platform. So, buyers are the customers of ZARA.

- (a) The first argument is true. The second one is false.
- (b) The first argument is false. The second one is true.
- (c) Both arguments are true but the first argument is not the cause of the second argument.
- (d) Both arguments are true and the first argument is the cause of the second argument.

### Question 7

A number can be represented in 2'S compliment format. The ALU can then perform subtraction by using full adders.

- (a) The first argument is true. The second one is false.
- (b) The first argument is false. The second one is true.

- (c) Both arguments are true but the first argument is not the cause of the second argument.
- (d) Both arguments are true and the first argument is the cause of the second argument.

### Question 8

The functions of an information system is largely determined by the business operations of a firm. So, the selection of information technologies for developing an information system is largely determined by the business operations.

- (a) The first argument is true. The second one is false.
- (b) The first argument is false. The second one is true.
- (c) Both arguments are true but the first argument is not the cause of the second argument.
- (d) Both arguments are true and the first argument is the cause of the second argument.

### Question 9

Performing addition of two binary numbers is started from the leftmost bit to the rightmost bit. So, our English writing is from left to right.

- (a) The first argument is true. The second one is false.
- (b) The first argument is false. The second one is true.
- (c) Both arguments are true but the first argument is not the cause of the second argument.
- (d) Both arguments are true and the first argument is the cause of the second argument.

### Question 10

Different numbers (lengths) of bits for a negative number which are represented in 2'S compliment format will have different bit patterns. Substraction of two positive numbers  $X$  and  $Y$  can be done by addition of the  $X$  and  $-Y$ .

- (a) The first argument is true. The second one is false.
- (b) The first argument is false. The second one is true.
- (c) Both arguments are true but the first argument is not the cause of the second argument.
- (d) Both arguments are true and the first argument is the cause of the second argument.

**Question 11**

Which of the following problems would occur in your cell phone if you do not log out any online account?

- (i) A lot of memory space will be used for handling each of these online applications.
- (ii) Network connection will become unstable as all the online applications compete for network communication.
- (iii) Battery can easily be out of electricity.

**Answer:**

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

**Question 12**

Which of the following statements is TRUE?

- (a) Without electricity, it is not possible to have an information system.
- (b) Without computer, it is not possible to have an information system.
- (c) Without computer network, it is not possible to have an information system.
- (d) Decision making is not a function of an information system.

**Question 13**

Which of the following companies have been playing a role as a market maker?

- (i) Alibaba
- (ii) eBay
- (iii) Apple
- (iv) AirBNB

**Answer:**

- (a) (i) and (ii).
- (b) (i), (ii) and (iii).
- (c) (i), (ii) and (iv).
- (d) (i), (iii) and (iv).
- (e) (ii), (iii) and (iv).
- (f) (i), (ii), (iii) and (iv).

**Question 14**

In term of computational power, which of the following ranking is correct?

- (a) Cell phone > Notebook > Desktop computer > Supercomputer.
- (b) Notebook > Cell Phone > Desktop computer > Supercomputer.
- (c) Desktop computer > Supercomputer > Notebook > Cell phone.
- (d) Supercomputer > Desktop computer > Notebook > Cell phone.

**Question 15**

Which of the following system(s) is(are) an operating system ?

- (i) Mac OS
- (ii) iOS
- (iii) Android
- (iv) Linux

**Answer:**

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

**Question 16**

Which of the following functions are the functions of MS Window?

- (i) File management.
- (ii) Multi-task management.
- (iii) Memory management.
- (iv) System initialization.

**Answer:**

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

**Question 17**

Which of the following functions are the functions of iOS?

- (i) File management.
- (ii) Multi-task management.
- (iii) Memory management.
- (iv) System initialization.

**Answer:**

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

**Question 18**

When a computer has just been turned on, the CPU will get its first instruction from a special memory device. What is it?

- (a) BIOS.
- (b) RAM.
- (c) Main memory (i.e. hard drive).
- (d) None of the above.

**Question 19**

To manage multiple processes running on a single CPU, one common method is called \_\_\_\_\_. Difference processes are assigned with different time slots. So that, in each time slot, there is only one process can use the CPU.

- (a) Time-sharing processing
- (b) Parallel processing
- (c) Distributed processing
- (d) None of the above.

**Question 20**

Which of the following settings if they are turned "ON", you can connect to the Internet?

- (i) WiFi.
- (ii) Bluetooth.
- (iii) Cellular.

**Answer:**

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

**Question 21**

Which of the following software cannot be installed in an Android phone?

- (a) LINE.
- (b) WhatsApp.
- (c) Google Map.
- (d) iOS.

**Question 22**

Which of the following hardware is not part of a modern cell phone?

- (a) CPU.
- (b) GPU.
- (c) Microphone.
- (d) Cloud memory.

**Question 23**

Which of the following statements are TRUE?

- (i) All logic gates can be implemented by NAND gates only.
- (ii) All logical operations can be implemented by NAND gates only.
- (iii) All arithmetic operations can be implemented by NAND gates only.

**Answer:**

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

**Question 24**

The following is the truth table of a half adder. What are the values  $X$  and  $Y$ ?

A	B	C	Z
0	0	Y	Y
0	1	Y	X
1	0	Y	X
1	1	X	Y

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

**Question 25**

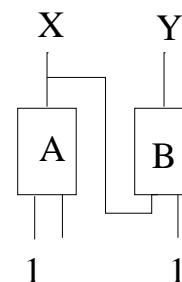
The following is the truth table of a full adder. What are the values  $X$  and  $Y$ ?

A	B	D	C	Z
0	0	0	X	X
0	0	1	X	Y
0	1	0	X	Y
0	1	1	Y	X
1	0	0	X	Y
1	0	1	Y	X
1	1	0	Y	X
1	1	1	Y	Y

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

**Diagram for Questions 26-30**

It is a circuit consisting of two logic gates.



**Question 26**

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 27**

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 28**

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 29**

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 30**

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 31**

Convert  $148_{10}$  in **16-bit 2'S complement formate**.

- (a) 0000000010010100<sub>2</sub>.
- (b) 0000000100010100<sub>2</sub>.
- (c) 0000001010010100<sub>2</sub>.
- (d) 0000000101010100<sub>2</sub>.

**Question 32**

Convert  $-148_{10}$  in **16-bit 2'S complement formate** and then convert this binary bit patterns in hexadecimal form.

- (a) *FEEB*.
- (b) *FF6B*.
- (c) *FF6C*.
- (d) *FEEC*.

**Question 33**

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

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

**Question 34**

What is the value of '1111111111111111' (represented in **16-bit 2'S compliment** format) in decimal form?

- (a)  $2^{16} - 1$ .
- (b)  $2^{15} - 1$ .
- (c)  $1 - 2^{16}$ .
- (d)  $1 - 2^{15}$ .
- (e)  $-1$ .
- (f)  $0$ .

**Question 35**

For a binary number which is represented in 6-bit 2's complement formate, what are the numbers that can be represented?

- (a)  $-15$  to  $15$ .
- (b)  $-31$  to  $31$ .
- (c)  $-63$  to  $63$ .
- (d)  $0$  to  $63$ .

**Question 36**

Suppose a number is represented by an 16-bit **unsigned** number formate. Which of the following number is the output of the CPU after performing  $64 \times 64$ .

- (a) 0010000000000000.
- (b) 0001000000000000.
- (c) 0010000000000010.
- (d) 0001000000000010.

**Question 37**

Suppose a number is represented by an 16-bit **unsigned** number formate. Which of the following number is the output of the CPU after performing  $1024 \times 64$ .

- (a) 1000000000000000.

- (b) 0100000000000000.
- (c) 1000000000000010.
- (d) Overflow.

**Question 38**

Suppose a number is represented by an 16-bit **2'S compliment** number formate. Which of the following number is the output of the CPU after performing  $64 \times 64$ .

- (a) 0010000000000000.
- (b) 0001000000000000.
- (c) 0010000000000010.
- (d) 0001000000000010.

**Question 39**

Suppose a number is represented by an 16-bit **2'S compliment** number formate. Which of the following number is the output of the CPU after performing  $1024 \times 64$ .

- (a) 1000000000000000.
- (b) 0100000000000000.
- (c) 1000000000000010.
- (d) Overflow.

**Question 40**

In the ASCII table, what is the code for "Backspace".

- (a) 00001000.
- (b) 00011000.
- (c) 00001010.
- (d) 00001101.

**Question 41**

How many bytes are needed to code the message "John Sum is a handsome professor."?

- (a) 31 bytes.
- (b) 32 bytes.
- (c) 33 bytes.
- (d) 34 bytes.

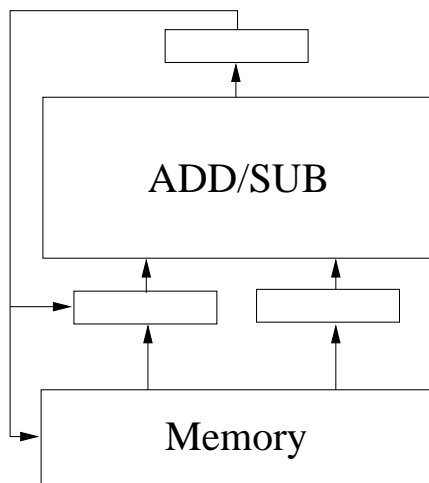
**Question 42**

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

**Diagram for Questions 43-50**

Below is a simple circuit. It consists of a **memory** with 16 memory spaces (from M1 to M16), an **ADD/SUB block**, 2 **input registers** (IA and IB) and one **output register** (OUT). M1 to M16, IA, IB and OUT are all 4 bits long. Numbers are represented in *2's compliment* format.



Six commands (MOV, ADD, SUB, MUL, DIV and CMP) are provided for instructing the above circuit. The syntax and the descriptions of these commands are depicted in the following table.

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	$OUT = b_1b_2b_3b_4.$ $b_i = 0$ if $X_i = Y_i.$ $b_i = 1$ if $X_i \neq Y_i.$

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

**Question 43**

```

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

```

Suppose the initial contents of M1, M2, M3 and M4 are given by

$M1 = 0001, M2 = 0010, M3 = 0001, M4 = 0000.$

What is the content of M4 once the program is finished?

- (a) 0010
- (b) 0011
- (c) 0100
- (d) 0101

**Question 44**

```

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

```



Suppose the initial contents of M1, M2, M3 and M4 are given by

$M1 = 0011, M2 = 0010, M3 = 0001, M4 = 0000.$

What is the content of M4 once the program is finished?

- (a) 0010
- (b) 0011
- (c) 0100
- (d) 0110

### Question 45

```

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

```

Suppose the initial contents of M1, M2, M3 and M4 are given by

$M1 = 0001, M2 = 0010, M3 = 0010, M4 = 0000.$

What is the content of M4 once the program is finished?

- (a) 0010
- (b) 0011
- (c) 0100
- (d) 0110

### Question 46

```

-----
MOV IA M1
MOV IB M2
SUB IA IB
MOV IA OUT
SUB IA IB
MOV IA OUT
SUB IA IB
-----

```

```

MOV IA OUT
MOV IB M3
MUL IA IB
MOV M4 OUT
-----

```

Suppose the initial contents of M1, M2, M3 and M4 are given by

$M1 = 0111, M2 = 0010, M3 = 0100, M4 = 0000.$

What is the content of M4 once the program is finished?

- (a) 0010
- (b) 0011
- (c) 0100
- (d) 0110

### Question 47

```

-----
MOV IA M1
MOV IB M2
ADD IA IB
MOV IA OUT
MOV IB M3
ADD IA IB
MOV IA OUT
MOV IB M4
SUB IA IB
MOV M5 OUT
-----

```

Suppose the initial contents of M1, M2, M3, M4 and M5 are given by

$M1 = 0011, M2 = 0010, M3 = 0001,$   
 $M4 = 0100, M5 = 0110.$

What are the contents of IA, IB, OUT and M5 once the program is finished?

- (a)  $IA = 0100, IB = 0110, OUT = 0010, M5 = 0010$
- (b)  $IA = 0000, IB = 0000, OUT = 0000, M5 = 0010$
- (c)  $IA = 0110, IB = 0100, OUT = 0010, M5 = 0010$
- (d)  $IA = 0100, IB = 0110, OUT = 0000, M5 = 0010$

### Question 48

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 49

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 M5 OUT
MOV IA M3
MOV IB M4
MUL IA IB
MOV IA OUT
MOV IB M5
ADD IA IB
MOV M5 OUT
```

-----

Which of the following equations does the above program segment perform?

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

### Question 50

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 equations does the above program segment perform?

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