

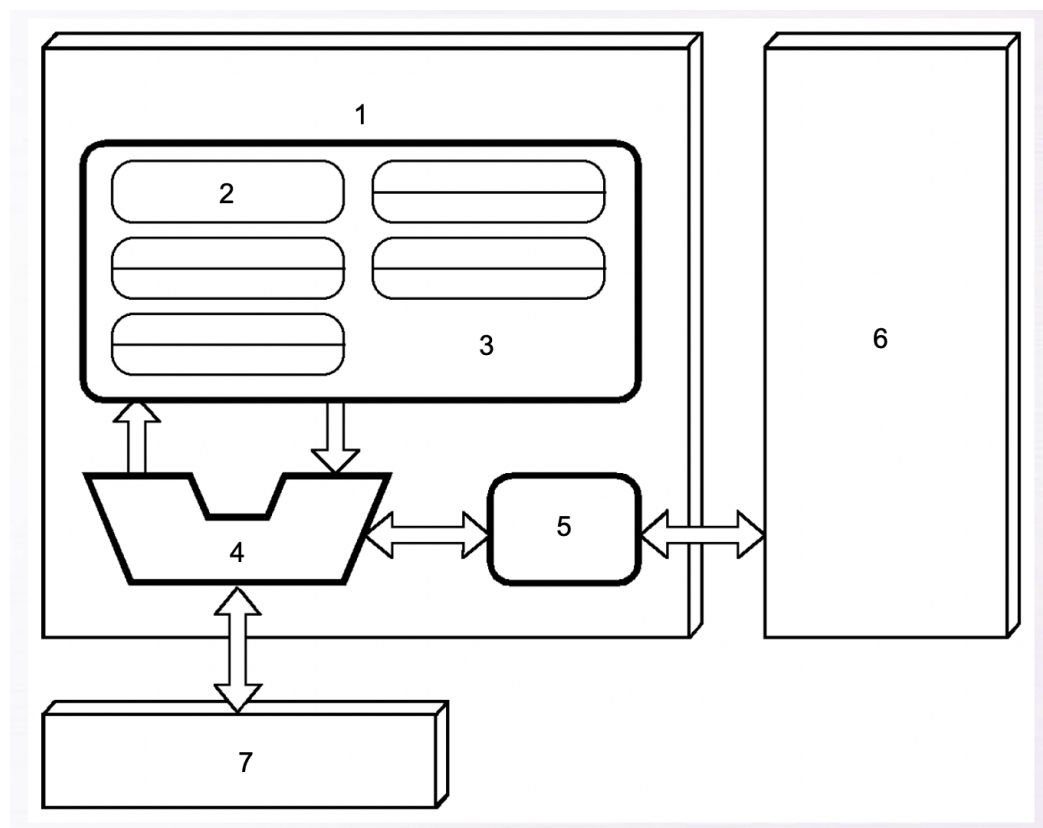
## Review Test Submission: Semester Test 1

User	_____
Course	COS 284 S2 2023
Test	Semester Test 1
Started	8/25/23 5:30 PM
Submitted	8/25/23 6:59 PM
Due Date	8/25/23 7:00 PM
Status	Completed
Attempt Score	19 out of 48 points
Time Elapsed	1 hour, 29 minutes out of 1 hour and 30 minutes

### Question 1

3 out of 3.5 points

Consider following diagram that represents the Von Neuman Architecture.



Identify the components (1) to (7) by selecting the sentence that appropriately describes them.

Question 2

0 out of 1 points

A disk manufacturer sells a disk that it claims has a capacity of 60 gigabytes.

Compared to a 4 megabyte drive that the company used to manufacture, how many times will the 60 gigabyte drive be bigger than the 4 megabyte drive?

Stated differently, how many of the 4 megabyte drives will be required if the same capacity as the 60 gigabyte drive is to be achieved?

Answer: [1]

Question 3

0 out of 1 points

Assume you buy a 1 terabyte disk.

Assuming that all the space on the disk is available to the operating system, what will the size of the disk be as reported by the operating system in gigabytes?

Only provide the integer portion of the answer.

Answer: [1] gigabytes

Question 4

4 out of 5 points

Convert  $(45)_7$  to base 18 by filling in the blanks below.

Base 7 to decimal:

$(45)_7 = ([1] \times 7^1) + ([2] \times 7^0) = ([3])_{10}$

Decimal to base 18:

Division	Quotient	Remainder
[4]/18	[5]	[6]
[7]/18	[8]	[9]

Hence,  $(45)_7 = ([10])_{18}$

Question 5

3.5 out of 3.5 points

Fill in the blanks such that the calculation correctly implements the conversion from decimal to base 5 via the multiplication method.

	. [1]
	<div><div>×</div><div></div><div>5</div></div>
3.	[2]
	. [3]
	<div><div>×</div><div></div><div>5</div></div>
1.	[4]
	. [5]
	<div><div>×</div><div></div><div>5</div></div>
4.	[6]
	. [7]
	<div><div>×</div><div></div><div>5</div></div>
4.	0000

Hint: You should fill in the blanks from bottom to top.

## Question 6

2.5 out of 4 points

Consider the following additions of 4-bit binary numbers using two's complement arithmetic.

For each addition, provide the 4-bit result in binary and indicate whether an overflow occurs (Y) or whether no overflow occurs (N).

1101

+ 1111

Result: **[R1]**

Overflow? (Y/N) **[A]**

0010

+ 0101

Result: **[R2]**

Overflow? (Y/N) **[B]**

1001

+ 0111

Result: **[R3]**

Overflow? (Y/N) **[C]**

1001

+ 1010

Result: **[R4]**

Overflow? (Y/N) **[D]**

### Question 7

2 out of 2 points

Consider the following application of Booth's multiplication algorithm.

Based on the given computational steps, determine the multiplicand and the multiplier.

**[1]** (multiplicand)

× **[2]** (multiplier)

+ 00000000

+ 1111011

+ 000101

+ 11011

### Question 8

0 out of 2 points

Suppose the following data string is to be transmitted: 10011110

The polynomial used to calculate a CRC corresponds with the bit string 1100

Use polynomial division to divide the data string by this value.

Determine the remainder (that would be added to a data string as a CRC).

Also provide the quotient of the calculation to determine the remainder.

Provide your answers as bit strings.

Remainder (CRC): **[1]**

Quotient: **[2]**

### Question 9

0 out of 2 points

Determine the quotient and remainder when the polynomial  $x^5 + x^4 + x^2 + x$  is divided by 110 in modulo 2 arithmetic.

Provide your answers as bit strings.

Quotient: **[Q]**

Remainder: **[R]**

Question 10

1 out of 4 points

Convert the number 4.15625 to binary using the IEEE-754 standard.

Assume you only have 15 bits in total. Specifically, 9 bits for the exponent and 5 bits for the significand.

The bias for the exponent is **[1]**.

The exponent bit string is **[2]**.

The significand bit string is **[3]**.

If you convert the result back to decimal you get **[4]**.

Question 11

0 out of 2 points

In Hamming codes with data words of length 504, what is the minimum number of check/parity bits needed for correcting single-bit errors?

Answer: **[1]**

How long will the resulting code words be?

Answer: **[2]**

Question 12

0 out of 6 points

What is the hamming code word of the data word 11000111 using even parity?

Provide your answer by completing the table below.

[A]	[B]	[C]	[D]	[E]	[F]	[G]	[H]	[I]	[J]	[K]	[L]
12	11	10	9	8	7	6	5	4	3	2	1

### Question 13

0 out of 1 points

You receive the bit string that follows as a Hamming code constructed using even parity. At most one bit could have changed. Which bit changed? Write 0 if no bit changed during transmission. Received data: 101101110001

### Question 14

0 out of 1 points

Suppose an Intel processor executes the instruction: `mov rax,0x5284EFD5`. What is the value of `ah` after the `MOVE`? Provide your answer in hexadecimal, including leading zeroes. Do not use the `0x` prefix in your answer.

### Question 15

0 out of 3 points

Complete the missing assembler instructions below such that the value in the **al** register is 15.

`mov al, 0xf0`

**[1]** `al`

**[2]** `al, 0xff`

**[3]** `al, 0xf0`

### Question 16

3 out of 3 points

High level programming languages have ternary operators that allow the conditional assignment of values.

Complete the assembler instructions below to simulate the following ternary statement:

`rax = rbx < 0 ? rcx : [ten]`

`mov rbx, 0xffffffffffffb`

`mov rcx, 7`

**[1]** `rbx, 0`

**[2]** `rax, rcx`

**[3]** `rax, qword [ten]`

## Question 17

0 out of 4 points

Given:

segment .data

a: dq 2,4,6,8,10,12,14,16,18

b: dd 20,22,24,28

c: dq 30,32,34,36

d: dq 38,40,42,44,46

What will the value of rax be after the following cases have been executed assuming rax was initialised to 0?

**a)**

```
lea rcx,[a]
mov rax,[rcx]
```

**[1]**

**b)**

```
lea rcx,[d+16]
sub rcx,48
mov rax,[rcx]
```

**[2]**

**c)**

```
lea rcx,[a]
mov rdi,4
mov rax,[rcx+8*rdi]
```

**[3]**

**d)**