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|  | **Computer Organization & Assembly Language**  **BSCS-3**  **Department of Computer Science**  **Bahria University, Lahore Campus** |

**Assignment: [1]**

Date: Week 4, 13th March 2023

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Roll No: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| **Evaluation of CLO** | **Question Number** | **Marks** | **Obtained Marks** |
| **CLO1: Develop an understanding of the underlying concepts of Assembly language.** | 1 | 6 |  |
| 2 | 5 |  |
| 3 | 5 |  |
| 4 | 4 |  |
| **Total Marks** | | **20** |  |

**Question 1: [Marks: 6]**

A memory location has a physical address 5BA00h. Compute

1. The offset address if the segment number is 51ACh. [2]
2. The segment number if the offset address is 4D10h? [2]
3. Determine the physical address of a memory location given by 70F6:1BC0h. [2]

a.

Offset address = physical address - segment x10h

Offset address = 5BA00h - 51ACh x 10h = 9F40h

b.

Segment number = (physical address - offset)/ 10h

Segment number = (5BA00h - 4D10h)/10h = 56CFh

c.

Physical address = (70F6h x 10h) + 1BC0h = 72B20h

**Question 2: [Marks: 5]**

What is the binary representation of D5B7h? Also calculate the unsigned and signed decimal interpretation of this number.

The hexadecimal number D5B7h can be converted to its binary representation as follows:

D5B7h = 1101 0101 1011 0111b

To calculate the unsigned decimal interpretation of this binary number, we simply convert it to decimal by summing the values of each bit multiplied by its corresponding power of 2:

1101 0101 1011 0111b = 54,711

Therefore, the unsigned decimal interpretation of D5B7h is 54,423.

To calculate the signed decimal interpretation of D5B7h, we need to determine the most significant bit (MSB), which is the leftmost bit, and determine whether it represents a positive or negative number. In this case, the MSB is 1, which means that the number is negative because it is a signed 16-bit number in two's complement form. To find the absolute value of the number, we invert all the bits and add 1 to the result:

1101 0101 1011 0111b (original number)

0010 1010 0100 1000b (inverted bits)

0010 1010 0100 1001b (inverted bits + 1)

The absolute value of the number is 10,744, so the signed decimal interpretation of D5B7h is -10,825.

Therefore, the binary representation of D5B7h is 1101 0101 1011 0111b, the unsigned decimal interpretation is 54,711, and the signed decimal interpretation is -10,825.

**Question 03:** **[Marks: 5]**

Using only basic arithmetic instructions, translate the given statement into assembly language.

Assume A, B and C are word variables:

A = B + 2 – (C\*2)

Note: It is the main structure of the code

lw $t0, B # load B into temporary register $t0

add $t1, C, C # add C to itself to multiply it by 2 and store result in $t1

sub $t2, $t0, $t1 # subtract C\*2 from B and store result in $t2

addi $t3, $t2, 2 # add 2 to the result and store in $t3

sw $t3, A # store the final result in A

Explanation:

lw $t0, B: Load the value of variable B into temporary register $t0.

add $t1, C, C: Add the values in C to itself to multiply it by 2, and store the result in $t1.

sub $t2, $t0, $t1: Subtract the value in $t1 from the value in $t0, and store the result in $t2.

addi $t3, $t2, 2: Add 2 to the value in $t2, and store the result in $t3.

sw $t3, A: Store the final result in $t3 into variable A.

**Question 04:** Perform the following addition or subtraction: **[Marks: 4]**

1. FE02h + 1E01h (2)

To add two hexadecimal numbers, we add each column starting from the rightmost column. If the sum of the columns is greater than or equal to 16, we carry over to the next column.

FE02

+ 1E01

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11C03

1. 10110100b – 10010111b

To subtract two binary numbers, we subtract each column starting from the rightmost column. If the digit in the minuend is smaller than the corresponding digit in the subtrahend, we borrow from the next column.

10110100

- 10010111

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00011101