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

**Assignment: [4]**

Date: Week 13, 6th June 2023

Name:

Roll No:

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| **Evaluation of CLO** | **Question Number** | **Marks** | **Obtained Marks** |
| **CLO1,2,3** | 1 | 10 |  |
| 2 | 10 |  |
|  |  |  |
|  |  |  |
| **Total Marks** | | **20** |  |

**Question 2: [Marks: 10]**

1. Implement a recursive program that takes in a number and finds the square of that number through addition. For example if the number 3 is entered, you would add 3+3+3=9. If 4 is entered you would add 4+4+4+4=16. This program must be implemented using recursion to add the numbers together.

**Code:**

.data

input1: .asciiz "Enter The number: "

square: .asciiz "Square of "

square2: .asciiz " is: "

gap: .asciiz " "

.text

main:

la $a0, input1

li $v0, 4

syscall

li $v0, 5

syscall

move $s0, $v0

move $s1, $v0

li $t0, 1

jal squareRecursion

jal outputResult

squareRecursion:

addi $sp, $sp, -8

sw $s0, 4($sp)

sw $ra, 0($sp)

beq $s0, $t0, returnSquare

addi $s0, $s0, -1

jal squareRecursion

returnSquare:

lw $s0, 4($sp)

add $t1, $t1, $s0 #n+(n-1)

add $t1, $t1, $s0 #(n+(n-1))+n

add $t1, $t1, -1 #((n+(n-1))+n)-1

lw $ra, 0($sp)

addi $sp, $sp, 8

jr $ra

outputResult:

la $a0, square

li $v0, 4

syscall

move $a0, $s1

li $v0, 1

syscall

la $a0, square2

li $v0, 4

syscall

move $a0, $t1

li $v0, 1

syscall

j end

end:

li $v0, 10

syscall

**Output:**

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Description automatically generated

1. Write a recursive function to calculate the summation of numbers from 1 to n. For example if the user enters 5, your program would add 1+2+3+4+5 and print out the answer 15.

**Code:**

.data

input1: .asciiz "Enter The number : "

add: .asciiz "Adiition of 1 to "

add2: .asciiz " is : "

.text

main:

la $a0, input1

li $v0,4

syscall

li $v0,5

syscall

move $s0, $v0

move $s1,$v0

j Output

addrecursion:

addi $sp, $sp, -8

sw $ra, 0($sp)

sw $s0, 4($sp)

beq $s0, $t0, return

addi $s0, $s0, -1 #n+=(n-1)

jal addrecursion

return:

lw $s0, 4($sp)

add $t1,$s0,$t1

lw $ra, 0($sp)

addi $sp, $sp, 8

jr $ra

Output:

la $a0,add

li $v0,4

syscall

move $a0,$s1

li $v0,1

syscall

la $a0,add2

li $v0,4

syscall

li $t0, 0

jal addrecursion

move $a0 , $t1

li $v0,1

syscall

j end

end:

li $v0,10

syscall

**Output:**

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Description automatically generated

1. Write a recursive program to calculate Fibonacci numbers. Use the definition of a Fibonacci number where F(n) = F(n-1) + F(n-2).

**Code:**

.data

input1: .asciiz "Enter The number : "

add: .asciiz "Fibonacci series "

add2: .asciiz " th term is : "

.text

main:

la $a0, input1

li $v0,4

syscall

li $v0,5

syscall

move $s0, $v0

j Output

fibonacci:

beq $s0, 0, return1

beq $s0, 1, return2

addi $sp, $sp, -12

sw $ra, 0($sp)

sw $s0, 4($sp)

sw $s1, 8($sp)

addi $s0, $s0, -1

jal fibonacci #f(n-1)

move $s1,$t3

addi $s0, $s0, -1

jal fibonacci #f(n-2)

add $t3, $s1, $t3

lw $ra, 0($sp)

lw $s0, 4($sp)

lw $s1, 8($sp)

addi $sp, $sp, 12

jr $ra

return1:

li $t3,1

j return3

return2:

li $t3,0

j return4

return3:

jr $ra

return4:

jr $ra

Output:

la $a0,add

li $v0,4

syscall

move $a0,$s0

li $v0,1

syscall

la $a0,add2

li $v0,4

syscall

li $t0, 0

jal fibonacci

move $a0,$t3

li $v0,1

syscall

j end

end:

li $v0,10

syscall

**Output:**

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