

Computer Organization

Assignment 2: Sequential Construct-II

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Q1 - MIPS assembly program that takes user first name as an input and prompt the message "Hi Ajay, MIPS assembly programming is very exciting to learn"

```
#Sambit Sahoo 22277

.data
    message1: .asciiz "Enter your first name:"
    message2: .asciiz "Hi "
    message3: .asciiz ", MIPS assembly programming is very exciting to learn"
    name: .space 26

.text
.globl main
main:
    li $v0, 4
    la $a0, message1      #Enter your first name:
    syscall

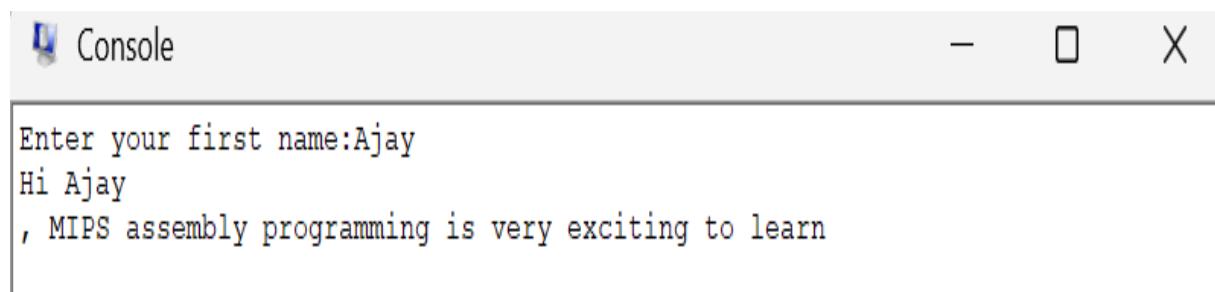
    li $v0 8
    la $a0, name          #input
    li $a1, 26
    syscall

    li $v0, 4
    la $a0, message2      #Hi
    syscall

    li $v0, 4
    la $a0, name          #print name
    syscall

    li $v0, 4
    la $a0, message3      #, MIPS assembly programming is very exciting to learn.
    syscall

    li $v0, 10
    syscall
```



The screenshot shows a terminal window titled "Console". The window contains the following text:

```
Enter your first name:Ajay
Hi Ajay
, MIPS assembly programming is very exciting to learn
```

Int Regs [10]	
PC	= 4194424
EPC	= 0
Cause	= 0
BadVAddr	= 0
Status	= 805371664
HI	= 0
LO	= 0
R0 [r0]	= 0
R1 [at]	= 268500992
R2 [v0]	= 10
R3 [v1]	= 0
R4 [a0]	= 268501019
R5 [a1]	= 26
R6 [a2]	= 2147480512
R7 [a3]	= 0
R8 [t0]	= 0
R9 [t1]	= 0
R10 [t2]	= 0
R11 [t3]	= 0
R12 [t4]	= 0
R13 [t5]	= 0
R14 [t6]	= 0
R15 [t7]	= 0
R16 [s0]	= 0
R17 [s1]	= 0
R18 [s2]	= 0
R19 [s3]	= 0
R20 [s4]	= 0
R21 [s5]	= 0
R22 [s6]	= 0
R23 [s7]	= 0
R24 [t8]	= 0
R25 [t9]	= 0
R26 [k0]	= 0
R27 [k1]	= 0
R28 [gp]	= 268468224
R29 [sp]	= 2147480500
R30 [s8]	= 0
R31 [ra]	= 4194328

FP Regs

FIR = 38912
FCSR = 0

Single Precision

FG0 = 0.000000
FG1 = 0.000000
FG2 = 0.000000
FG3 = 0.000000
FG4 = 0.000000
FG5 = 0.000000
FG6 = 0.000000
FG7 = 0.000000
FG8 = 0.000000
FG9 = 0.000000
FG10 = 0.000000
FG11 = 0.000000
FG12 = 0.000000
FG13 = 0.000000
FG14 = 0.000000
FG15 = 0.000000
FG16 = 0.000000
FG17 = 0.000000
FG18 = 0.000000
FG19 = 0.000000
FG20 = 0.000000
FG21 = 0.000000
FG22 = 0.000000
FG23 = 0.000000
FG24 = 0.000000

```
.....  
FG25 = 0.000000  
FG26 = 0.000000  
FG27 = 0.000000  
FG28 = 0.000000  
FG29 = 0.000000  
FG30 = 0.000000  
FG31 = 0.000000
```

Double Precision

```
FP0 = 0.000000  
FP2 = 0.000000  
FP4 = 0.000000  
FP6 = 0.000000  
FP8 = 0.000000  
FP10 = 0.000000  
FP12 = 0.000000  
FP14 = 0.000000  
FP16 = 0.000000  
FP18 = 0.000000  
FP20 = 0.000000  
FP22 = 0.000000  
FP24 = 0.000000  
FP26 = 0.000000  
FP28 = 0.000000  
FP30 = 0.000000
```

Q2 - An assembly program that takes principle amount, rate of interest and time (taken as an input to integer register) as an input from the user and calculate simple interest and display the raw and absolute results to the user.

```

#Sambit Sahoo 22277

.data
    st1: .asciiz "Enter principal amount: "
    st2: .asciiz "Enter interest rate: "
    st3: .asciiz "Enter time: "
    msgraw: .asciiz "Raw result (p*r*t) = "
    msgabsolute: .asciiz "\nAbsolute result (p*r*t/100) = "

.text
.globl main
main:
    li $v0, 4
    la $a0, st1
    syscall

    li $v0, 5      #v0 = 5 reads integer
    syscall
    move $t0, $v0

    li $v0, 4
    la $a0, st2
    syscall

    li $v0, 5
    syscall
    move $t1, $v0

    li $v0, 4
    la $a0, st3
    syscall

```

```

    li $v0, 5
    syscall
    move $t2, $v0

    mul $t3, $t0, $t1
    mul $s0, $t3, $t2      #s0 = p*r*t

    li $v0, 4
    la $a0, msgraw
    syscall

    li $v0, 1
    move $a0, $s0
    syscall

    li $t4, 100
    div $s0, $t4
    mflo $s1      # s1 = (p*r*t) / 100

    li $v0, 4
    la $a0, msgabsolute
    syscall

    li $v0, 1      # 1 to print integer value
    move $a0, $s1
    syscall

    li $v0, 10
    syscall

```



Console

-



```
Enter principal amount: 30000
Enter interest rate: 21
Enter time: 7
Raw result (p*r*t) = 4410000
Absolute result (p*r*t/100) = 44100
```

Int Regs [10]

PC	= 4194500
EPC	= 0
Cause	= 0
BadVAddr	= 0
Status	= 805371664
HI	= 0
LO	= 44100
R0 [r0]	= 0
R1 [at]	= 268500992
R2 [v0]	= 10
R3 [v1]	= 0
R4 [a0]	= 44100
R5 [a1]	= 2147480504
R6 [a2]	= 2147480512
R7 [a3]	= 0
R8 [t0]	= 30000
R9 [t1]	= 21
R10 [t2]	= 7
R11 [t3]	= 630000
R12 [t4]	= 100
R13 [t5]	= 0
R14 [t6]	= 0
R15 [t7]	= 0
R16 [s0]	= 4410000
R17 [s1]	= 44100
R18 [s2]	= 0
R19 [s3]	= 0
R20 [s4]	= 0
R21 [s5]	= 0
R22 [s6]	= 0
R23 [s7]	= 0
R24 [t8]	= 0
R25 [t9]	= 0
R26 [k0]	= 0
R27 [k1]	= 0
R28 [gp]	= 268468224
R29 [sp]	= 2147480500
R30 [s8]	= 0
R31 [ra]	= 4194328

FP Regs

x

FIR = 38912

FCSR = 0

Single Precision

FG0 = 0.000000

FG1 = 0.000000

FG2 = 0.000000

FG3 = 0.000000

FG4 = 0.000000

FG5 = 0.000000

FG6 = 0.000000

FG7 = 0.000000

FG8 = 0.000000

FG9 = 0.000000

FG10 = 0.000000

FG11 = 0.000000

FG12 = 0.000000

FG13 = 0.000000

FG14 = 0.000000

FG15 = 0.000000

FG16 = 0.000000

FG17 = 0.000000

FG18 = 0.000000

FG19 = 0.000000

FG20 = 0.000000

FG21 = 0.000000

FG22 = 0.000000

FG23 = 0.000000
FG24 = 0.000000
FG25 = 0.000000
FG26 = 0.000000
FG27 = 0.000000
FG28 = 0.000000
FG29 = 0.000000
FG30 = 0.000000
FG31 = 0.000000

Double Precision

FP0 = 0.000000
FP2 = 0.000000
FP4 = 0.000000
FP6 = 0.000000
FP8 = 0.000000
FP10 = 0.000000
FP12 = 0.000000
FP14 = 0.000000
FP16 = 0.000000
FP18 = 0.000000
FP20 = 0.000000
FP22 = 0.000000
FP24 = 0.000000
FP26 = 0.000000
FP28 = 0.000000
FP30 = 0.000000

Q3- Write an assembly program that takes three character string from the user and print the second character from it. (Hint: use lbu instruction).

```
#Sambit Sahoo 22277

.data
    st1: .asciiiz "Enter a three char string: "
    string: .space 4          #4 is allocated as there is a null string.
    st2: .asciiz "\n The second char is: "

.text
.globl main
main:
    #Print "Enter a three char string"
    li $v0, 4
    la $a0, st1
    syscall

    #Read the string
    li $v0, 8
    la $a0, string
    li $a1, 4
    syscall
```

```
la $t0, string          # load address of string
lbu $t1, 1($t0)         # load second byte (unsigned) into $t1

#Print "The second char is:"
li $v0, 4
la $a0, st2
syscall

# Print the second character
li $v0, 11
move $a0, $t1           #move as la expects label not register
syscall

li $v0, 10
syscall
```

Enter a three char string: Sam

The second char is: a

Int Regs [10]

PC	= 4194416
EPC	= 0
Cause	= 0
BadVAddr	= 0
Status	= 805371664
HI	= 0
LO	= 0
R0 [r0]	= 0
R1 [at]	= 268500992
R2 [v0]	= 10
R3 [v1]	= 0
R4 [a0]	= 97
R5 [a1]	= 4
R6 [a2]	= 2147480512
R7 [a3]	= 0
R8 [t0]	= 268501020
R9 [t1]	= 97
R10 [t2]	= 0
R11 [t3]	= 0
R12 [t4]	= 0
R13 [t5]	= 0
R14 [t6]	= 0
R15 [t7]	= 0
R16 [s0]	= 0
R17 [s1]	= 0
R18 [s2]	= 0
R19 [s3]	= 0
R20 [s4]	= 0
R21 [s5]	= 0
R22 [s6]	= 0
R23 [s7]	= 0
R24 [t8]	= 0
R25 [t9]	= 0
R26 [k0]	= 0
R27 [k1]	= 0
R28 [gp]	= 268468224
R29 [sp]	= 2147480500
R30 [s8]	= 0
R31 [ra]	= 4194328

FP Regs

x

FIR = 38912

FCSR = 0

Single Precision

FG0 = 0.000000

FG1 = 0.000000

FG2 = 0.000000

FG3 = 0.000000

FG4 = 0.000000

FG5 = 0.000000

FG6 = 0.000000

FG7 = 0.000000

FG8 = 0.000000

FG9 = 0.000000

FG10 = 0.000000

FG11 = 0.000000

FG12 = 0.000000

FG13 = 0.000000

FG14 = 0.000000

FG15 = 0.000000

FG16 = 0.000000

FG17 = 0.000000

FG18 = 0.000000

FG19 = 0.000000

FG20 = 0.000000

FG21 = 0.000000

FG22 = 0.000000

```
FG23 = 0.000000  
FG24 = 0.000000  
FG25 = 0.000000  
FG26 = 0.000000  
FG27 = 0.000000  
FG28 = 0.000000  
FG29 = 0.000000  
FG30 = 0.000000  
FG31 = 0.000000
```

Double Precision

```
FP0 = 0.000000  
FP2 = 0.000000  
FP4 = 0.000000  
FP6 = 0.000000  
FP8 = 0.000000  
FP10 = 0.000000  
FP12 = 0.000000  
FP14 = 0.000000  
FP16 = 0.000000  
FP18 = 0.000000  
FP20 = 0.000000  
FP22 = 0.000000  
FP24 = 0.000000  
FP26 = 0.000000  
FP28 = 0.000000  
FP30 = 0.000000
```

Q4. Write an assembly program that takes two strings (of length of two characters) from the user and calculate the hamming distance. For example if “hi” and “he” are the input from the user then the hamming distance is 01.

```
#Sambit Sahoo 22277

.data
    msg1: .asciiz "Enter str1: "
    msg2: .asciiz "\nEnter str2: "
    msg3: .asciiz "\nHamming distance: "
    string1: .space 3
    string2: .space 3

.text
.globl main
main:
    li $v0, 4
    la $a0, msg1
    syscall

    li $v0, 8
    la $a0, string1
    li $a1, 3
    syscall

    li $v0, 4
    la $a0, msg2
    syscall

    li $v0, 8
    la $a0, string2
    li $a1, 3
    syscall
```

```
la $s1, string1
lbu $t0, 0($s1)
lbu $t1, 1($s1)

la $s2, string2
lbu $t2, 0($s2)
lbu $t3, 1($s2)

sne $t4, $t0, $t2
sne $t5, $t1, $t3

li $v0, 4
la $a0, msg3
syscall

li $v0, 1
move $a0, $t4
syscall

li $v0, 1
move $a0, $t5
syscall

li $v0, 10
syscall
```

Console

```
Enter str1: sr
Enter str2: sh
Hamming distance: 01
```

Int Regs [10]

PC	= 4194524
EPC	= 0
Cause	= 0
BadVAddr	= 0
Status	= 805371664
HI	= 0
LO	= 0
R0 [r0]	= 0
R1 [at]	= 268500992
R2 [v0]	= 10
R3 [v1]	= 0
R4 [a0]	= 1
R5 [a1]	= 3
R6 [a2]	= 2147480512
R7 [a3]	= 0
R8 [t0]	= 114
R9 [t1]	= 117
R10 [t2]	= 115
R11 [t3]	= 97
R12 [t4]	= 1
R13 [t5]	= 1
R14 [t6]	= 0
R15 [t7]	= 0
R16 [s0]	= 0
R17 [s1]	= 268501039
R18 [s2]	= 268501042
R19 [s3]	= 0
R20 [s4]	= 0
R21 [s5]	= 0
R22 [s6]	= 0
R23 [s7]	= 0
R24 [t8]	= 0
R25 [t9]	= 0
R26 [k0]	= 0
R27 [k1]	= 0
R28 [gp]	= 268468224
R29 [sp]	= 2147480500
R30 [s8]	= 0
R31 [ra]	= 4194328

FP Regs

FIR = 38912

FCSR = 0

Single Precision

FG0 = 0.000000

FG1 = 0.000000

FG2 = 0.000000

FG3 = 0.000000

FG4 = 0.000000

FG5 = 0.000000

FG6 = 0.000000

FG7 = 0.000000

FG8 = 0.000000

FG9 = 0.000000

FG10 = 0.000000

FG11 = 0.000000

FG12 = 0.000000

FG13 = 0.000000

FG14 = 0.000000

FG15 = 0.000000

FG16 = 0.000000

FG17 = 0.000000

FG18 = 0.000000

FG19 = 0.000000

FG20 = 0.000000

FG21 = 0.000000

FG22 = 0.000000

FG23 = 0.000000
FG24 = 0.000000
FG25 = 0.000000
FG26 = 0.000000
FG27 = 0.000000
FG28 = 0.000000
FG29 = 0.000000
FG30 = 0.000000
FG31 = 0.000000

Double Precision

FP0 = 0.000000
FP2 = 0.000000
FP4 = 0.000000
FP6 = 0.000000
FP8 = 0.000000
FP10 = 0.000000
FP12 = 0.000000
FP14 = 0.000000
FP16 = 0.000000
FP18 = 0.000000
FP20 = 0.000000
FP22 = 0.000000
FP24 = 0.000000
FP26 = 0.000000
FP28 = 0.000000
FP30 = 0.000000