

Computer Organization

Assignment 2: Sequential Construct-II

Sambit Sahoo (22277)

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
```

 Console

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

Int Regs [10]		x
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: .ascii "Enter principal amount: "  
st2: .ascii "Enter interest rate: "  
st3: .ascii "Enter time: "  
msgraw: .ascii "Raw result (p*r*t) = "  
msgabsolute: .ascii "\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		
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: .asciiz "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