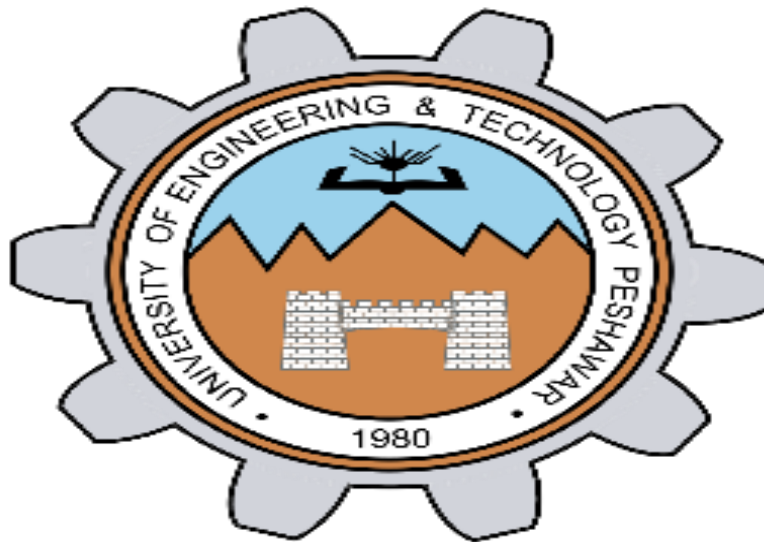


**University of Engineering & Technology,
Peshawar**

DEPARTMENT OF COMPUTER SYSTEM ENGINEERING

Fall 2021



LAB 02

(CSE-304L)

Computer Organization and Architecture Lab

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Addition: add two numbers

Source code:

```
.text
```

```
main:
```

```
li $v0,5
```

```
syscall
```

```
move $t0,$v0
```

```
li $v0,5
```

```
syscall
```

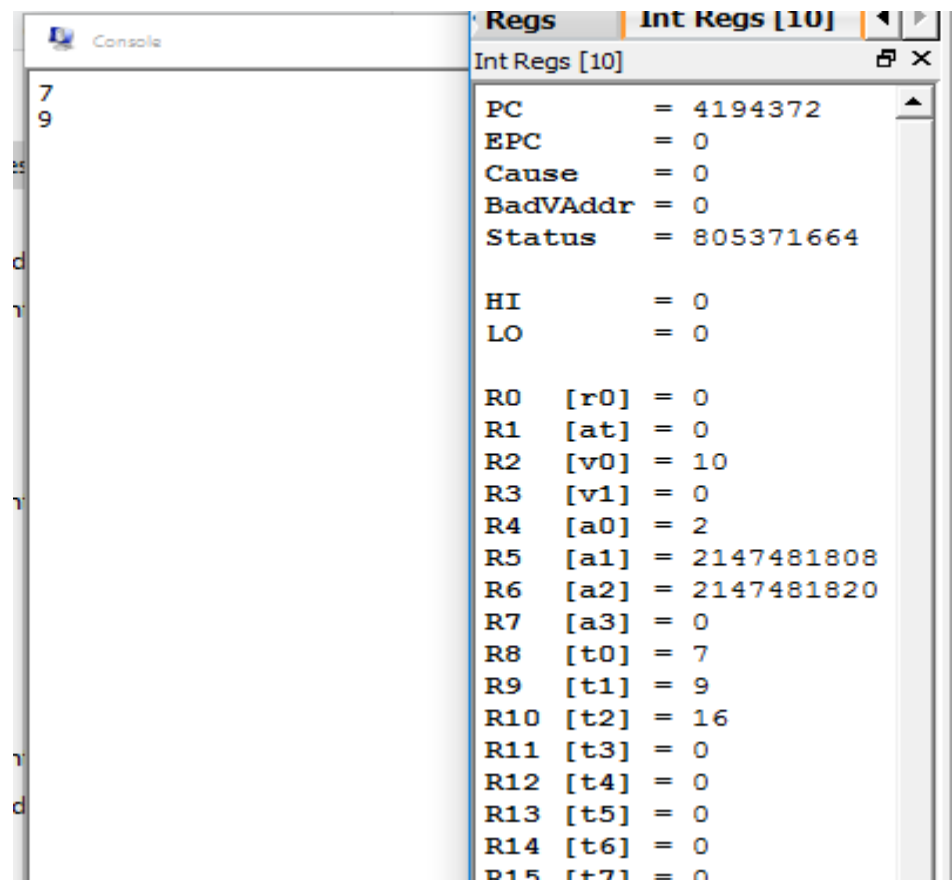
```
move $t1,$v0
```

```
add $t2,$t0,$t1
```

```
li $v0,10
```

```
syscall
```

Output:



Regs		Int Regs [10]	
PC	=	4194372	
EPC	=	0	
Cause	=	0	
BadVAddr	=	0	
Status	=	805371664	
HI	=	0	
LO	=	0	
R0	[r0]	=	0
R1	[at]	=	0
R2	[v0]	=	10
R3	[v1]	=	0
R4	[a0]	=	2
R5	[a1]	=	2147481808
R6	[a2]	=	2147481820
R7	[a3]	=	0
R8	[t0]	=	7
R9	[t1]	=	9
R10	[t2]	=	16
R11	[t3]	=	0
R12	[t4]	=	0
R13	[t5]	=	0
R14	[t6]	=	0
R15	[t7]	=	0

Addition immediate:

Source code:

```
.text  
  
main:  
  
li $v0,5  
  
syscall  
  
move $t0,$v0  
  
addi $t1,$t0,8  
  
li $v0,10  
  
syscall
```

Output:

Console		EPC	= 0
5		Cause	= 0
		BadVAddr	= 0
		Status	= 805371664
		HI	= 0
		LO	= 0
		R0 [r0]	= 0
		R1 [at]	= 0
		R2 [v0]	= 10
		R3 [v1]	= 0
		R4 [a0]	= 2
		R5 [a1]	= 2147481808
		R6 [a2]	= 2147481820
		R7 [a3]	= 0
		R8 [t0]	= 5
		R9 [t1]	= 13
		R10 [t2]	= 0
		R11 [t3]	= 0
		R12 [t4]	= 0
		R13 [t5]	= 0
		R14 [t6]	= 0
		R15 [t7]	= 0
		R16 [s0]	= 0

Subtraction:

Source code:

```
.text
```

```
main:
```

```
li $v0,5
```

```
syscall
```

```
move $t0,$v0
```

```
li $v0,5
```

```
syscall
```

```
move $t1,$v0
```

```
sub $t2,$t1,$t0
```

```
move $a0,$t2
```

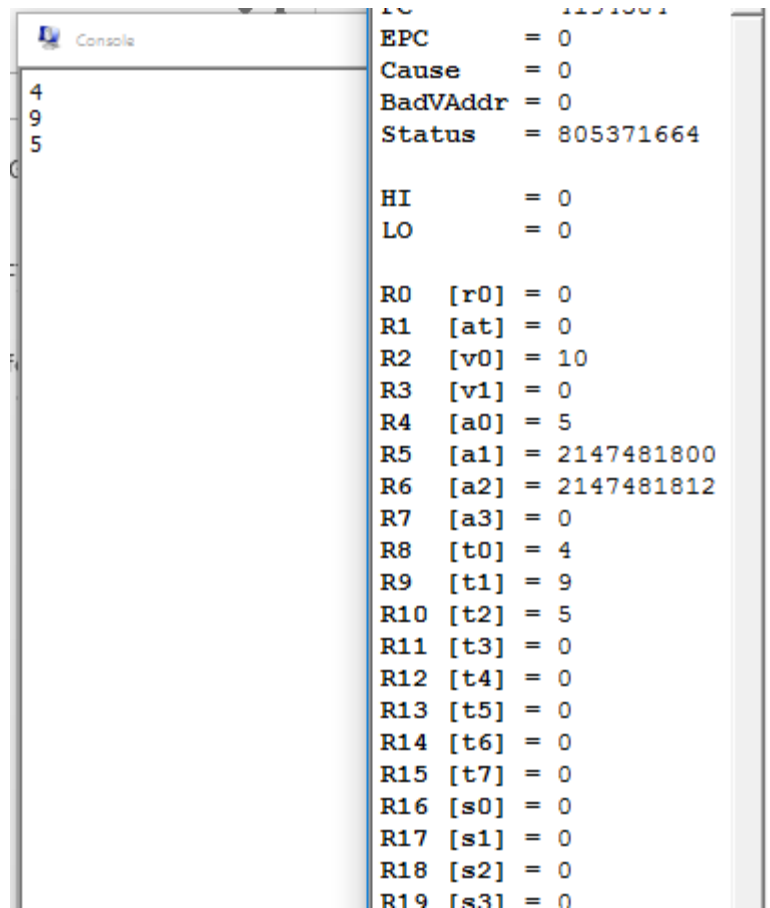
```
li $v0,1
```

```
syscall
```

```
li $v0,10
```

```
syscall
```

Output:



The screenshot shows a console window titled "Console" with the following output:

EPC	=	0
Cause	=	0
BadVAddr	=	0
Status	=	805371664
HI	=	0
LO	=	0
R0 [r0]	=	0
R1 [at]	=	0
R2 [v0]	=	10
R3 [v1]	=	0
R4 [a0]	=	5
R5 [a1]	=	2147481800
R6 [a2]	=	2147481812
R7 [a3]	=	0
R8 [t0]	=	4
R9 [t1]	=	9
R10 [t2]	=	5
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

Multiplication(mul):

Source code:

Output:

```
.text
```

```
main:
```

```
li $v0,5
```

```
syscall
```

```
move $t0,$v0
```

```
li $v0,5
```

```
syscall
```

```
move $t1,$v0
```

```
mul $t2,$t1,$t0
```

```
move $a0,$t2
```

```
li $v0,1
```

```
syscall
```

```
li $v0,10
```

```
syscall
```

Console		EPC	=	0
		Cause	=	0
		BadVAddr	=	0
		Status	=	805371664
		HI	=	0
		LO	=	24
		R0 [r0]	=	0
		R1 [at]	=	0
		R2 [v0]	=	10
		R3 [v1]	=	0
		R4 [a0]	=	24
		R5 [a1]	=	2147481808
		R6 [a2]	=	2147481820
		R7 [a3]	=	0
		R8 [t0]	=	4
		R9 [t1]	=	6
		R10 [t2]	=	24
		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

Multiplication(mult):

Source code:

```
.text
main:
li $v0,5
syscall
move $t0,$v0
li $v0,5
syscall
move $t1,$v0
mult $t1,$t0
mflo $t2
move $a0,$t2
li $v0,1
syscall
li $v0,10
syscall
```

Output:

Console		HI	=	0
		Cause	=	0
		BadVAddr	=	0
		Status	=	805371664
		HI	=	0
		LO	=	35
		R0 [r0]	=	0
		R1 [at]	=	0
		R2 [v0]	=	10
		R3 [v1]	=	0
		R4 [a0]	=	35
		R5 [a1]	=	2147481808
		R6 [a2]	=	2147481820
		R7 [a3]	=	0
		R8 [t0]	=	5
		R9 [t1]	=	7
		R10 [t2]	=	35
		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

Division:

Source code:

```
.text

main:

li $v0,5

syscall

move $t0,$v0

li $v0,5

syscall

move $t1,$v0

div $t2,$t1,$t0

move $a0,$t2

li $v0,1

syscall

li $v0,10

syscall
```

Output:

4 44 11	EPC	= 0
	Cause	= 0
	BadVAddr	= 0
	Status	= 805371664
	HI	= 0
	LO	= 11
	R0 [r0]	= 0
	R1 [at]	= 0
	R2 [v0]	= 10
	R3 [v1]	= 0
	R4 [a0]	= 11
	R5 [a1]	= 2147481808
	R6 [a2]	= 2147481820
	R7 [a3]	= 0
	R8 [t0]	= 4
	R9 [t1]	= 44
	R10 [t2]	= 11
	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

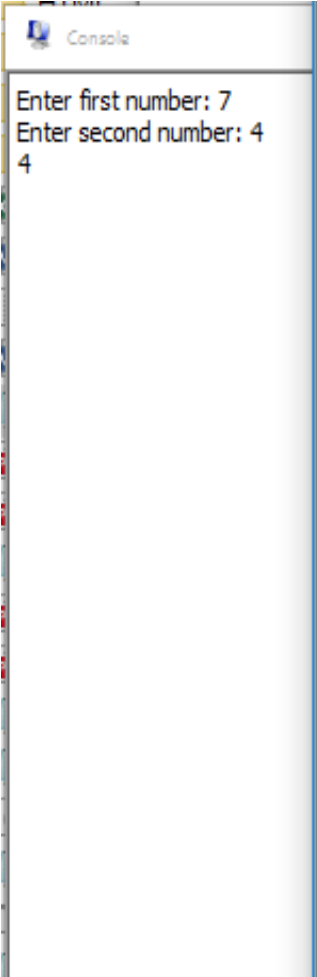
$t_2 = \frac{t_1}{t_0}$

And:

Source code:

```
.data
str: .asciiz"Enter first number: "
str1: .asciiz"Enter second number: "
.text
main:
li $v0,4
la $a0,str    syscall
li $v0,5     syscall
move $t0,$v0
li $v0,4
la $a0,str1   syscall
li $v0,5     syscall
move $t1,$v0
and $t2,$t0,$t1
move $a0,$t2
li $v0,1
syscall
li $v0,10
syscall
```

Output:



The screenshot shows a console window with the following text:

```
Enter first number: 7
Enter second number: 4
4
```

Below the console window, a register dump is displayed, showing the values of registers R0 through R20:

Register	Value
HI	= 0
LO	= 0
R0 [r0]	= 0
R1 [at]	= 268500992
R2 [v0]	= 10
R3 [v1]	= 0
R4 [a0]	= 4
R5 [a1]	= 2147481808
R6 [a2]	= 2147481820
R7 [a3]	= 0
R8 [t0]	= 7
R9 [t1]	= 4
R10 [t2]	= 4
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

ANDI:

Source code:

```
.data
str: .asciiz"Enter number: "

.text

main:

li $v0,4

la $a0,str

syscall

li $v0,5

syscall

move $t0,$v0

andi $t1,$t0,4

move $a0,$t1

li $v0,1

syscall

li $v0,10

syscall
```

Output:

Console		HI	= 0
Enter number: 7		LO	= 0
4		R0 [r0]	= 0
		R1 [at]	= 0
		R2 [v0]	= 10
		R3 [v1]	= 0
		R4 [a0]	= 4
		R5 [a1]	= 2147481808
		R6 [a2]	= 2147481820
		R7 [a3]	= 0
		R8 [t0]	= 7
		R9 [t1]	= 4
		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

OR:

Source code:

```
.data
str: .asciiz"Enter first number: "
str1: .asciiz"Enter second number: "

.text

main:

li $v0,4

la $a0,str    syscall

li $v0,5

syscall

move $t0,$v0

li $v0,4

la $a0,str1

syscall

li $v0,5

syscall

move $t1,$v0

or $t2,$t0,$t1

move $a0,$t2

li $v0,1

syscall

li $v0,10

syscall
```

Output:

Console	PC	=	4194412
Enter first number: 7	EPC	=	0
Enter second number: 6	Cause	=	0
7	BadVAddr	=	0
	Status	=	805371664
	HI	=	0
	LO	=	0
	R0 [r0]	=	0
	R1 [at]	=	268500992
	R2 [v0]	=	10
	R3 [v1]	=	0
	R4 [a0]	=	7
	R5 [a1]	=	2147481808
	R6 [a2]	=	2147481820
	R7 [a3]	=	0
	R8 [t0]	=	7
	R9 [t1]	=	6
	R10 [t2]	=	7
	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

ORI:

Source code:

```
.data
str: .ascii"Enter number: "

.text

main:

li $v0,4

la $a0,str

syscall

li $v0,5

syscall

move $t0,$v0

ori $t1,$t0,6

move $a0,$t1

li $v0,1

syscall

li $v0,10

syscall
```

Output:

Console	PC	=	4194384
	EPC	=	0
Enter number: 7 7	Cause	=	0
	BadVAddr	=	0
	Status	=	805371664
	HI	=	0
	LO	=	0
	R0 [r0]	=	0
	R1 [at]	=	0
	R2 [v0]	=	10
	R3 [v1]	=	0
	R4 [a0]	=	7
	R5 [a1]	=	2147481808
	R6 [a2]	=	2147481820
	R7 [a3]	=	0
	R8 [t0]	=	7
	R9 [t1]	=	7
	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

XOR:

Source code:

```
.data
str: .asciiz"Enter first number: "
str1: .asciiz"Enter second number: "

.text

main:

li $v0,4

la $a0,str    syscall

li $v0,5      syscall

move $t0,$v0

li $v0,4

la $a0,str1   syscall

li $v0,5      syscall

move $t1,$v0

xor $t2,$t0,$t1

move $a0,$t2

li $v0,1

syscall

li $v0,10

syscall
```

Output:

Console		PC	=	4194412
Enter first number: 6		EPC	=	0
Enter second number: 8		Cause	=	0
14		BadVAddr	=	0
		Status	=	805371664
		HI	=	0
		LO	=	0
		R0 [r0]	=	0
		R1 [at]	=	268500992
		R2 [v0]	=	10
		R3 [v1]	=	0
		R4 [a0]	=	14
		R5 [a1]	=	2147481808
		R6 [a2]	=	2147481820
		R7 [a3]	=	0
		R8 [t0]	=	6
		R9 [t1]	=	8
		R10 [t2]	=	14
		R11 [t3]	=	0
		R12 [t4]	=	0
		R13 [t5]	=	0
		R14 [t6]	=	0
		R15 [t7]	=	0
		R16 [s0]	=	0
		R17 [s1]	=	0
		R18 [s2]	=	0

XORI:

Source code:

Output:

```
.data
```

```
str: .asciiz"Enter number: "
```

```
.text
```

```
main:
```

```
li $v0,4
```

```
la $a0,str
```

```
syscall
```

```
li $v0,5
```

```
syscall
```

```
move $t0,$v0
```

```
xori $t1,$t0,8
```

```
move $a0,$t1
```

```
li $v0,1
```

```
syscall
```

```
li $v0,10
```

```
syscall
```

Console		PC	=	4194384
Enter number: 6		EPC	=	0
14		Cause	=	0
		BadVAddr	=	0
		Status	=	805371664
		HI	=	0
		LO	=	0
		R0 [r0]	=	0
		R1 [at]	=	0
		R2 [v0]	=	10
		R3 [v1]	=	0
		R4 [a0]	=	14
		R5 [a1]	=	2147481808
		R6 [a2]	=	2147481820
		R7 [a3]	=	0
		R8 [t0]	=	6
		R9 [t1]	=	14
		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