

LAB 4

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Assignment 1

Code:

#Laboratory Exercise 4, Assignment 1

.text

start:

```
addi $s1, $zero, 10
addi $s2, $zero, 0xffffffff
li $t0,0          #No Overflow is default status
addu $s3,$s1,$s2   # s3 = s1 + s2
xor $t1,$s1,$s2    #Test if $s1 and $s2 have the same sign
bltz $t1,EXIT      #If not, exit
slt $t2,$s3,$s1
bltz $s1,NEGATIVE  #Test if $s1 and $s2 is negative?
beq $t2,$zero,EXIT #s1 and $s2 are positive
# if $s3 > $s1 then the result is not overflow
j OVERFLOW
```

NEGATIVE:

```
bne $t2,$zero,EXIT #s1 and $s2 are negative
```

if \$s3 < \$s1 then the result is not overflow

OVERFLOW:

```
li $t0,1          #the result is overflow
```

EXIT:

Result:

- Test case:

```
li $s1, -2
```

```
li $s2, -2147483647
```

Run speed at max (no interaction)

File Edit Run Settings Tools Help

Run speed at max (no interaction)

Registers Coproc 1 Coproc 0

Name	Number	Value
\$zero	0	0
\$at	1	0
\$v0	2	0
\$v1	3	0
\$a0	4	0
\$a1	5	0
\$a2	6	0
\$a3	7	0
\$a0	8	0
\$t1	9	0
\$t2	10	0
\$t3	11	0
\$t4	12	0
\$t5	13	0
\$t6	14	0
\$t7	15	0
\$a0	16	0
\$a1	17	0
\$a2	18	0
\$a3	19	0
\$a4	20	0
\$a5	21	0
\$a6	22	0
\$a7	23	0
\$t8	24	0
\$t9	25	0
\$t0	26	0
\$k1	27	0
\$gp	28	268468224
\$sp	29	2147479548
\$fp	30	0
\$ra	31	0
pc		4194304
hi		0
lo		0

Mars Messages Run I/O

pc: execution terminated by null instruction.

Assembler: assembling D:\2023.2\TH KTM\T\MARSfile\Lab4\Assignment_1.asm

Assembler: operation completed successfully.

Run speed at max (no interaction)

File Edit Run Settings Tools Help

Run speed at max (no interaction)

Registers Coproc 1 Coproc 0

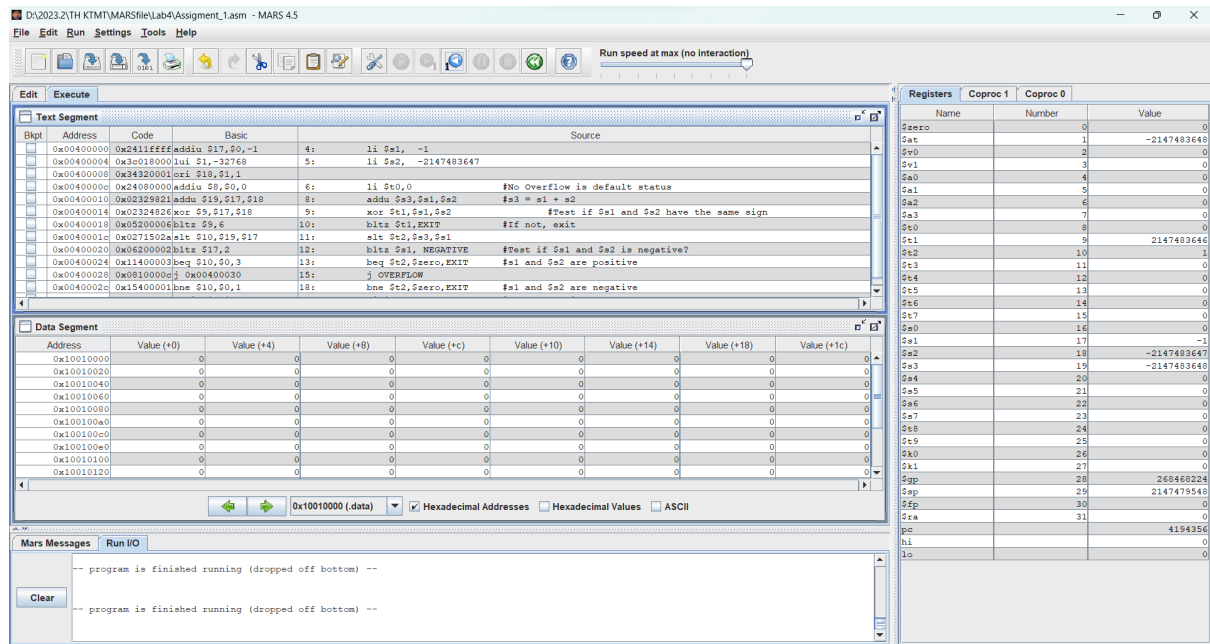
Name	Number	Value
\$zero	0	0
\$at	1	-2147483648
\$v0	2	0
\$v1	3	0
\$a0	4	0
\$a1	5	0
\$a2	6	0
\$a3	7	0
\$t0	8	1
\$t1	9	2147483647
\$t2	10	0
\$t3	11	0
\$t4	12	0
\$t5	13	0
\$t6	14	0
\$t7	15	0
\$a0	16	0
\$a1	17	-2
\$a2	18	-2147483647
\$a3	19	2147483647
\$a4	20	0
\$a5	21	0
\$a6	22	0
\$a7	23	0
\$t8	24	0
\$t9	25	0
\$t0	26	0
\$k1	27	0
\$gp	28	268468224
\$sp	29	2147479548
\$fp	30	0
\$ra	31	0
pc		4194356
hi		0
lo		0

Mars Messages Run I/O

-- program is finished running (dropped off bottom) --

-- program is finished running (dropped off bottom) --

- + Có hiện tượng tràn số khi cộng -2 với -2147483647
- + addu \$s3,\$s1,\$s2: trả về \$s3 = 2147483647 -> có hiện tượng tràn số
- + xor \$t1,\$s1,\$s2 : Kiểm tra s1 và s2 có trùng dấu hay không. Chỉ quan tâm đến bit dấu ở cuối -> bltz trả về nếu s1 và s2 khác dấu -> Không có hiện tượng overflow -> Exit
- + slt \$t2,\$s3,\$s1 : So sánh nếu tổng nhỏ hơn số hạng thì không overflow còn nếu tổng lớn hơn số hạng thì xét tới overflow
- Test case: Không tràn số (tổng nhỏ hơn số hạng)
 - li \$s1, -1
 - li \$s2, -2147483647



Assignment 2

Code:

#Lab 4, Assignment 2

.text

li \$s0, 0x5749	#Load test value to s0
andi \$t0, \$s0, 0xfffff00	#Extract MSB of s0 to t0
srl \$t0, \$t0, 8	
andi \$s0, \$s0, 0xfffff00	#Clear LSB of s0
ori \$s0, \$s0, 0xff	#Set LSB to 1
and \$s0, \$s0, \$zero	#Clear s0

Result:

D:\2023.2\TH KTM\T\MARSfile\Lab4\Assignment_2.asm - MARS 4.5

File Edit Run Settings Tools Help

Run speed at max (no interaction)

Edit Execute

Text Segment

Bkpt	Address	Code	Basic	Source
	0x00400000	0x24105749	addiu \$16,\$0,0x0000...	5: li \$s0, 0x5749 #load test value to s0
	0x00400004	0x3c01ffff	lui \$1,0xffffffff	7: andi \$t0, \$s0, 0xffffffff #Extract MSB of s0 to t0
	0x00400008	0x3421ff00	ori \$1,\$1,0x0000ff00	
	0x0040000c	0x02014024	and \$8,\$16,\$1	
	0x00400010	0x00084202	srl \$8,\$8,0x00000008	8: srl \$t0, \$t0, 8
	0x00400014	0x3c01ffff	lui \$1,0xffffffff	10: andi \$s0, \$s0, 0xffffffff #Clear LSB of s0
	0x00400018	0x3421ff00	ori \$1,\$1,0x0000ff00	
	0x0040001c	0x02018024	and \$16,\$16,\$1	
	0x00400020	0x361000ff	ori \$16,\$16,0x0000...	12: ori \$s0, \$s0, 0xff #Set LSB to 1
	0x00400024	0x02008024	and \$16,\$16,\$0	14: and \$s0, \$s0, \$zero #Clear s0

Data Segment

Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)	Value (+10)	Value (+14)	Value (+18)	Value (+1c)
0x10010000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010020	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010040	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010060	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010080	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100a0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100c0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100e0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010100	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010120	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000

Mars Messages Run I/O

pc: execution terminated by null instruction.

Assembly: assembling D:\2023.2\TH KTM\T\MARSfile\Lab4\Assignment_2.asm

Assembly: operation completed successfully.

Registers Coproc 1 Coproc 0

Name	Number	Value
\$zero	0	0x00000000
\$at	1	0x00000000
\$v0	2	0x00000000
\$v1	3	0x00000000
\$a0	4	0x00000000
\$a1	5	0x00000000
\$a2	6	0x00000000
\$a3	7	0x00000000
\$t0	8	0x00000000
\$t1	9	0x00000000
\$t2	10	0x00000000
\$t3	11	0x00000000
\$t4	12	0x00000000
\$t5	13	0x00000000
\$t6	14	0x00000000
\$t7	15	0x00000000
\$s0	16	0x00000000
\$s1	17	0x00000000
\$s2	18	0x00000000
\$s3	19	0x00000000
\$s4	20	0x00000000
\$s5	21	0x00000000
\$s6	22	0x00000000
\$s7	23	0x00000000
\$s8	24	0x00000000
\$s9	25	0x00000000
\$k0	26	0x00000000
\$k1	27	0x00000000
\$gp	28	0x10008000
\$fp	29	0x7ffffcfc
\$ra	30	0x00000000
\$pc	31	0x00400000
\$hi		0x00000000
\$lo		0x00000000

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File Edit Run Settings Tools Help

Run speed at max (no interaction)

Edit Execute

Text Segment

Bkpt	Address	Code	Basic	Source
	0x00400000	0x24105749	addiu \$16,\$0,0x0000...	5: li \$s0, 0x5749 #load test value to s0
	0x00400004	0x3c01ffff	lui \$1,0xffffffff	7: andi \$t0, \$s0, 0xffffffff #Extract MSB of s0 to t0
	0x00400008	0x3421ff00	ori \$1,\$1,0x0000ff00	
	0x0040000c	0x02014024	and \$8,\$16,\$1	
	0x00400010	0x00084202	srl \$8,\$8,0x00000008	8: srl \$t0, \$t0, 8
	0x00400014	0x3c01ffff	lui \$1,0xffffffff	10: andi \$s0, \$s0, 0xffffffff #Clear LSB of s0
	0x00400018	0x3421ff00	ori \$1,\$1,0x0000ff00	
	0x0040001c	0x02018024	and \$16,\$16,\$1	
	0x00400020	0x361000ff	ori \$16,\$16,0x0000...	12: ori \$s0, \$s0, 0xff #Set LSB to 1
	0x00400024	0x02008024	and \$16,\$16,\$0	14: and \$s0, \$s0, \$zero #Clear s0

Data Segment

Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)	Value (+10)	Value (+14)	Value (+18)	Value (+1c)
0x10010000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010020	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010040	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010060	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010080	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100a0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100c0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100e0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010100	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010120	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000

Mars Messages Run I/O

-- program is finished running (dropped off bottom) --

Reset: reset completed.

Registers Coproc 1 Coproc 0

Name	Number	Value
\$zero	0	0x00000000
\$at	1	0x00000000
\$v0	2	0x00000000
\$v1	3	0x00000000
\$a0	4	0x00000000
\$a1	5	0x00000000
\$a2	6	0x00000000
\$a3	7	0x00000000
\$t0	8	0x00000000
\$t1	9	0x00000000
\$t2	10	0x00000000
\$t3	11	0x00000000
\$t4	12	0x00000000
\$t5	13	0x00000000
\$t6	14	0x00000000
\$t7	15	0x00000000
\$s0	16	0x00005749
\$s1	17	0x00000000
\$s2	18	0x00000000
\$s3	19	0x00000000
\$s4	20	0x00000000
\$s5	21	0x00000000
\$s6	22	0x00000000
\$s7	23	0x00000000
\$s8	24	0x00000000
\$s9	25	0x00000000
\$k0	26	0x00000000
\$k1	27	0x00000000
\$gp	28	0x10008000
\$fp	29	0x7ffffcfc
\$ra	30	0x00000000
\$pc	31	0x00000000
\$hi		0x00400004
\$lo		0x00000000

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File Edit Run Settings Tools Help

Run speed at max (no interaction)

Edit Execute

Text Segment

Bkpt	Address	Code	Basic	Source
	0x00400000	0x24105749	addiu \$16,\$0,0x0000...	5: li \$a0, 0x5749 #Load test value to \$a0
	0x00400004	0x3c01ffff	lui \$1,0xffffffff	7: andi \$t0, \$a0, 0xffffffff #Extract MSB of \$a0 to \$t0
	0x00400008	0x3421ff00	ori \$1,\$1,0x0000ff00	
	0x0040000c	0x02014024	and \$8,\$16,\$1	
	0x00400010	0x00084202	srl \$8,\$8,0x00000008	8: srl \$t0, \$t0, 8
	0x00400014	0x3c01ffff	lui \$1,0xffffffff	10: andi \$a0, \$a0, 0xffffffff #Clear LSB of \$a0
	0x00400018	0x3421ff00	ori \$1,\$1,0x0000ff00	
	0x0040001c	0x02018024	and \$16,\$16,\$1	
	0x00400020	0x361000ff	ori \$16,\$16,0x0000...	12: ori \$a0, \$a0, 0xff #Set LSB to 1
	0x00400024	0x02008024	and \$16,\$16,\$0	14: and \$a0, \$a0, \$zero #Clear \$a0

Data Segment

Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)	Value (+10)	Value (+14)	Value (+18)	Value (+1c)
0x10010000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010020	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010040	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010060	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010080	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100a0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100c0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100e0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010100	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010120	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000

Mars Messages Run I/O

-- program is finished running (dropped off bottom) --

Clear

Reset: reset completed.

Registers Coproc 1 Coproc 0

Name	Number	Value
\$zero	0	0x00000000
\$at	1	0xffffffff
\$v0	2	0x00000000
\$v1	3	0x00000000
\$a0	4	0x00000000
\$a1	5	0x00000000
\$a2	6	0x00000000
\$a3	7	0x00000000
\$a4	8	0x00000000
\$a5	9	0x00000000
\$a6	10	0x00000000
\$a7	11	0x00000000
\$a8	12	0x00000000
\$a9	13	0x00000000
\$t0	14	0x00000000
\$t1	15	0x00000000
\$t2	16	0x00000000
\$t3	17	0x00000000
\$t4	18	0x00000000
\$t5	19	0x00000000
\$t6	20	0x00000000
\$t7	21	0x00000000
\$t8	22	0x00000000
\$t9	23	0x00000000
\$k0	24	0x00000000
\$k1	25	0x00000000
\$k2	26	0x00000000
\$k3	27	0x00000000
\$gp	28	0x10008000
\$sp	29	0x7ffffcfc
\$fp	30	0x00000000
\$ra	31	0x00000000
\$pc		0x00400028
\$hi		0x00000000
\$lo		0x00000000

- Extract MSB:

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File Edit Run Settings Tools Help

Run speed at max (no interaction)

Edit Execute

Text Segment

Bkpt	Address	Code	Basic	Source
	0x00400000	0x24105749	addiu \$16,\$0,0x0000...	5: li \$a0, 0x5749 #Load test value to \$a0
	0x00400004	0x3c01ffff	lui \$1,0xffffffff	7: andi \$t0, \$a0, 0xffffffff #Extract MSB of \$a0 to \$t0
	0x00400008	0x3421ff00	ori \$1,\$1,0x0000ff00	
	0x0040000c	0x02014024	and \$8,\$16,\$1	
	0x00400010	0x00084202	srl \$8,\$8,0x00000008	8: srl \$t0, \$t0, 8
	0x00400014	0x3c01ffff	lui \$1,0xffffffff	10: andi \$a0, \$a0, 0xffffffff #Clear LSB of \$a0
	0x00400018	0x3421ff00	ori \$1,\$1,0x0000ff00	
	0x0040001c	0x02018024	and \$16,\$16,\$1	
	0x00400020	0x361000ff	ori \$16,\$16,0x0000...	12: ori \$a0, \$a0, 0xff #Set LSB to 1
	0x00400024	0x02008024	and \$16,\$16,\$0	14: and \$a0, \$a0, \$zero #Clear \$a0

Data Segment

Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)	Value (+10)	Value (+14)	Value (+18)	Value (+1c)
0x10010000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010020	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010040	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010060	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010080	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100a0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100c0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100e0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010100	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010120	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000

Mars Messages Run I/O

-- program is finished running (dropped off bottom) --

Clear

Reset: reset completed.

Registers Coproc 1 Coproc 0

Name	Number	Value
\$zero	0	0x00000000
\$at	1	0xffffffff
\$v0	2	0x00000000
\$v1	3	0x00000000
\$a0	4	0x00000000
\$a1	5	0x00000000
\$a2	6	0x00000000
\$a3	7	0x00000000
\$a4	8	0x00000000
\$a5	9	0x00000000
\$a6	10	0x00000000
\$a7	11	0x00000000
\$a8	12	0x00000000
\$a9	13	0x00000000
\$t0	14	0x00000000
\$t1	15	0x00000000
\$t2	16	0x00000000
\$t3	17	0x00000000
\$t4	18	0x00000000
\$t5	19	0x00000000
\$t6	20	0x00000000
\$t7	21	0x00000000
\$t8	22	0x00000000
\$t9	23	0x00000000
\$k0	24	0x00000000
\$k1	25	0x00000000
\$k2	26	0x00000000
\$k3	27	0x00000000
\$gp	28	0x10008000
\$sp	29	0x7ffffcfc
\$fp	30	0x00000000
\$ra	31	0x00000000
\$pc		0x00400028
\$hi		0x00000000
\$lo		0x00000000

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File Edit Run Settings Tools Help

Run speed at max (no interaction)

Edit Execute

Text Segment

Bkpt	Address	Code	Basic	Source
	0x00400000	0x24105749	addiu \$16,\$0,0x0000...	5: li \$s0, 0x5749 #load test value to s0
	0x00400004	0x3c01ffff	lui \$1,0xffffffff	7: andi \$t0, \$s0, 0xffffffff #Extract MSB of s0 to t0
	0x00400008	0x3421ff00	ori \$1,\$1,0x0000ffff00	
	0x0040000c	0x02014024	and \$s,\$16,\$1	
	0x00400010	0x00084202	srl \$s,\$s,\$s,0x00000008	8: srl \$t0, \$t0, 8
	0x00400014	0x3c01ffff	lui \$1,0xffffffff	10: andi \$s0, \$s0, 0xffffffff #Clear LSB of s0
	0x00400018	0x3421ff00	ori \$1,\$1,0x0000ffff00	
	0x0040001c	0x02018024	and \$16,\$16,\$1	
	0x00400020	0x361000ff	ori \$16,\$16,0x0000...	12: ori \$s0, \$s0, 0xff #Set LSB to 1
	0x00400024	0x02008024	and \$16,\$16,\$0	14: and \$s0, \$s0, \$zero #Clear s0

Data Segment

Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)	Value (+10)	Value (+14)	Value (+18)	Value (+1c)
0x10010000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010020	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010040	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010060	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010080	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100a0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100c0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100e0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010100	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010120	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000

Mars Messages Run I/O

-- program is finished running (dropped off bottom) --

Reset: reset completed.

Registers Coproc 1 Coproc 0

Name	Number	Value
\$zero	0	0x00000000
\$at	1	0xffffffff
\$v0	2	0x00000000
\$v1	3	0x00000000
\$a0	4	0x00000000
\$a1	5	0x00000000
\$a2	6	0x00000000
\$a3	7	0x00000000
\$s0	8	0x00000057
\$s1	9	0x00000000
\$t2	10	0x00000000
\$t3	11	0x00000000
\$t4	12	0x00000000
\$t5	13	0x00000000
\$t6	14	0x00000000
\$t7	15	0x00000000
\$a0	16	0x00005749
\$a1	17	0x00000000
\$a2	18	0x00000000
\$a3	19	0x00000000
\$a4	20	0x00000000
\$a5	21	0x00000000
\$a6	22	0x00000000
\$a7	23	0x00000000
\$a8	24	0x00000000
\$t9	25	0x00000000
\$k0	26	0x00000000
\$k1	27	0x00000000
\$gp	28	0x10008000
\$ap	29	0x7fffffc
\$fp	30	0x00000000
\$ra	31	0x00000000
\$pc		0x00400014
\$hi		0x00000000
\$lo		0x00000000

- Set LSB to all bit 1

D:\2023\2\TH KTM\T\MARSfile\Lab4\Assignment_2.asm - MARS 4.5

File Edit Run Settings Tools Help

Run speed at max (no interaction)

Edit Execute

Text Segment

Bkpt	Address	Code	Basic	Source
	0x00400000	0x24105749	addiu \$16,\$0,0x0000...	5: li \$s0, 0x5749 #load test value to s0
	0x00400004	0x3c01ffff	lui \$1,0xffffffff	7: andi \$t0, \$s0, 0xffffffff #Extract MSB of s0 to t0
	0x00400008	0x3421ff00	ori \$1,\$1,0x0000ffff00	
	0x0040000c	0x02014024	and \$s,\$16,\$1	
	0x00400010	0x00084202	srl \$s,\$s,\$s,0x00000008	8: srl \$t0, \$t0, 8
	0x00400014	0x3c01ffff	lui \$1,0xffffffff	10: andi \$s0, \$s0, 0xffffffff #Clear LSB of s0
	0x00400018	0x3421ff00	ori \$1,\$1,0x0000ffff00	
	0x0040001c	0x02018024	and \$16,\$16,\$1	
	0x00400020	0x361000ff	ori \$16,\$16,0x0000...	12: ori \$s0, \$s0, 0xff #Set LSB to 1
	0x00400024	0x02008024	and \$16,\$16,\$0	14: and \$s0, \$s0, \$zero #Clear s0

Data Segment

Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)	Value (+10)	Value (+14)	Value (+18)	Value (+1c)
0x10010000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010020	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010040	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010060	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010080	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100a0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100c0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100e0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010100	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010120	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000

Mars Messages Run I/O

-- program is finished running (dropped off bottom) --

Reset: reset completed.

Registers Coproc 1 Coproc 0

Name	Number	Value
\$zero	0	0x00000000
\$at	1	0xffffffff
\$v0	2	0x00000000
\$v1	3	0x00000000
\$a0	4	0x00000000
\$a1	5	0x00000000
\$a2	6	0x00000000
\$a3	7	0x00000000
\$s0	8	0x00000057
\$s1	9	0x00000000
\$t2	10	0x00000000
\$t3	11	0x00000000
\$t4	12	0x00000000
\$t5	13	0x00000000
\$t6	14	0x00000000
\$t7	15	0x00000000
\$s0	16	0x00005700
\$a1	17	0x00000000
\$a2	18	0x00000000
\$a3	19	0x00000000
\$a4	20	0x00000000
\$a5	21	0x00000000
\$a6	22	0x00000000
\$a7	23	0x00000000
\$a8	24	0x00000000
\$t9	25	0x00000000
\$k0	26	0x00000000
\$k1	27	0x00000000
\$gp	28	0x10008000
\$ap	29	0x7fffffc
\$fp	30	0x00000000
\$ra	31	0x00000000
\$pc		0x00400014
\$hi		0x00000000
\$lo		0x00000000

D:\2023\2\TH KTM\T\MARSfile\Lab4\Assignment_2.asm - MARS 4.5

File Edit Run Settings Tools Help

Run speed at max (no interaction)

Edit Execute

Text Segment

Bkpt	Address	Code	Basic	Source
	0x00400000	0x24105749	addiu \$16,\$0,0x0000...	5: li \$s0, 0x5749 #Load test value to s0
	0x00400004	0x3c01ffff	lui \$1,0xffffffff	7: andi \$t0, \$s0, 0xffffffff #Extract MSB of s0 to t0
	0x00400008	0x3421ff00	ori \$1,\$1,0x0000ffff00	
	0x0040000c	0x02014024	and \$s,\$16,\$1	
	0x00400010	0x00084202	srl \$s,\$s,\$s,0x00000008	8: srl \$t0, \$t0, 8
	0x00400014	0x3c01ffff	lui \$1,0xffffffff	10: andi \$s0, \$s0, 0xffffffff #Clear LSB of s0
	0x00400018	0x3421ff00	ori \$1,\$1,0x0000ffff00	
	0x0040001c	0x02018024	and \$16,\$16,\$1	
	0x00400020	0x361000ff	ori \$16,\$16,0x0000...	12: ori \$a0, \$s0, 0xff #Set LSB to 1
	0x00400024	0x02008024	and \$16,\$16,\$0	14: and \$a0, \$s0, \$zero #Clear s0

Data Segment

Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)	Value (+10)	Value (+14)	Value (+18)	Value (+1c)
0x10010000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010020	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010040	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010060	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010080	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100a0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100c0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100e0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010100	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010120	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000

Mars Messages Run I/O

-- program is finished running (dropped off bottom) --

Clear

Reset: reset completed.

Registers Coproc 1 Coproc 0

Name	Number	Value
\$zero	0	0x00000000
\$at	1	0xffffffff
\$v0	2	0x00000000
\$v1	3	0x00000000
\$a0	4	0x00000000
\$a1	5	0x00000000
\$a2	6	0x00000000
\$a3	7	0x00000000
\$t0	8	0x00000057
\$t1	9	0x00000000
\$t2	10	0x00000000
\$t3	11	0x00000000
\$t4	12	0x00000000
\$t5	13	0x00000000
\$t6	14	0x00000000
\$t7	15	0x00000000
\$s0	16	0x000057ff
\$s1	17	0x00000000
\$s2	18	0x00000000
\$s3	19	0x00000000
\$s4	20	0x00000000
\$s5	21	0x00000000
\$s6	22	0x00000000
\$s7	23	0x00000000
\$s8	24	0x00000000
\$s9	25	0x00000000
\$k0	26	0x00000000
\$k1	27	0x00000000
\$gp	28	0x10008000
\$fp	29	0x7fffffc
\$ra	30	0x00000000
\$pc	31	0x00400024
\$hi		0x00000000
\$lo		0x00000000

- Clear \$s0

D:\2023\2\TH KTM\T\MARSfile\Lab4\Assignment_2.asm - MARS 4.5

File Edit Run Settings Tools Help

Run speed at max (no interaction)

Edit Execute

Text Segment

Bkpt	Address	Code	Basic	Source
	0x00400000	0x24105749	addiu \$16,\$0,0x0000...	5: li \$s0, 0x5749 #Load test value to s0
	0x00400004	0x3c01ffff	lui \$1,0xffffffff	7: andi \$t0, \$s0, 0xffffffff #Extract MSB of s0 to t0
	0x00400008	0x3421ff00	ori \$1,\$1,0x0000ffff00	
	0x0040000c	0x02014024	and \$s,\$16,\$1	
	0x00400010	0x00084202	srl \$s,\$s,\$s,0x00000008	8: srl \$t0, \$t0, 8
	0x00400014	0x3c01ffff	lui \$1,0xffffffff	10: andi \$s0, \$s0, 0xffffffff #Clear LSB of s0
	0x00400018	0x3421ff00	ori \$1,\$1,0x0000ffff00	
	0x0040001c	0x02018024	and \$16,\$16,\$1	
	0x00400020	0x361000ff	ori \$16,\$16,0x0000...	12: ori \$a0, \$s0, 0xff #Set LSB to 1
	0x00400024	0x02008024	and \$16,\$16,\$0	14: and \$a0, \$s0, \$zero #Clear s0

Data Segment

Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)	Value (+10)	Value (+14)	Value (+18)	Value (+1c)
0x10010000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010020	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010040	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010060	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010080	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100a0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100c0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100e0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010100	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010120	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000

Mars Messages Run I/O

-- program is finished running (dropped off bottom) --

Clear

Reset: reset completed.

Registers Coproc 1 Coproc 0

Name	Number	Value
\$zero	0	0x00000000
\$at	1	0xffffffff
\$v0	2	0x00000000
\$v1	3	0x00000000
\$a0	4	0x00000000
\$a1	5	0x00000000
\$a2	6	0x00000000
\$a3	7	0x00000000
\$t0	8	0x00000057
\$t1	9	0x00000000
\$t2	10	0x00000000
\$t3	11	0x00000000
\$t4	12	0x00000000
\$t5	13	0x00000000
\$t6	14	0x00000000
\$t7	15	0x00000000
\$s0	16	0x00000000
\$s1	17	0x00000000
\$s2	18	0x00000000
\$s3	19	0x00000000
\$s4	20	0x00000000
\$s5	21	0x00000000
\$s6	22	0x00000000
\$s7	23	0x00000000
\$s8	24	0x00000000
\$s9	25	0x00000000
\$k0	26	0x00000000
\$k1	27	0x00000000
\$gp	28	0x10008000
\$fp	29	0x7fffffc
\$ra	30	0x00000000
\$pc	31	0x00400024
\$hi		0x00000000
\$lo		0x00000000

Assignment 3

Code:

#Lab 4, Assignment 3

.text

```
li $s1, 5
li $s2, 10
```

```
#abs $s0, $s1
sra $t0, $s1, 31
```

```

        xor $s0, $t0, $s1
        subu $s0, $s0, $t0
        j skip

label:
        addi $t1, $0, 100
        j end

skip:
        #move $s0, $s1
        addu $s0, $0, $s1

        #not $s0, $s1
        nor $s0, $s1, $0

        #ble $s1, $s2, label
        slt $t2, $s2, $s1
        beq $t2, $0, label
        j end

end:

Result:
        #abs $s0, $s1

```

The screenshot displays the MARS 4.5 MIPS simulator interface. The main window is titled "D:\2023\2\TH KIMT\MARSFile\Lab4\Assignment_3.asm - MARS 4.5". The interface includes a menu bar (File, Edit, Run, Settings, Tools, Help), a toolbar, and a status bar indicating "Run speed at max (no interaction)".

The central pane shows the assembly code with the following instructions:

```

0x00400000: 0x2411ffff addiu $17,$0,-5      4: li $s1, -5
0x00400004: 0x2412000a addiu $19,$0,10       5: li $s2, 10
0x00400008: 0x001147c3 sra $2,$1,31         8: sra $s0, $s1, 31 #abs $s0, $s1
0x0040000c: 0x01180266 xor $16,$0,$17       9: xor $s0, $t0, $s1
0x00400010: 0x02088023 subu $16,$16,$8      10: subu $s0, $s0, $t0
0x00400014: 0x06100008 j 0x00400020          11: j skip
0x00400018: 0x20090064 addi $9,$0,100      13: addi $t1, $0, 100
0x0040001c: 0x081000d3 j 0x00400034          14: j end
0x00400020: 0x00118021 addu $16,$0,$17      17: addu $s0, $0, $s1 #move $s0, $s1
0x00400024: 0x02208027 nor $16,$17,$0      20: nor $s0, $s1, $0 #not $s0, $s1
0x00400028: 0x0251502a slt $10,$18,$17     23: slt $t2, $s2, $s1 #ble $s1, $s2, label
0x0040002c: 0x1140ffff beq $10,$0,-6       24: beq $t2, $0, label

```

The right pane shows the Registers window with the following values:

Name	Number	Value
\$zero	0	0
\$at	1	0
\$v0	2	0
\$v1	3	0
\$a0	4	0
\$a1	5	0
\$a2	6	0
\$a3	7	0
\$t0	8	-1
\$t1	9	0
\$t2	10	0
\$t3	11	0
\$t4	12	0
\$t5	13	0
\$t6	14	0
\$t7	15	0
\$s0	16	5
\$s1	17	-5
\$s2	18	10
\$s3	19	0
\$s4	20	0
\$s5	21	0
\$s6	22	0
\$s7	23	0
\$s8	24	0
\$s9	25	0
\$s0	26	0
\$s1	27	0
\$s2	28	268468224
\$s3	29	2147479548
\$s4	30	0
\$s5	31	0
\$f0		4194384
\$f1		0
\$f2		0
\$f3		0
\$f4		0
\$f5		0
\$f6		0
\$f7		0
\$f8		0
\$f9		0
\$f10		0
\$f11		0
\$f12		0
\$f13		0
\$f14		0
\$f15		0
\$f16		0
\$f17		0
\$f18		0
\$f19		0
\$f20		0
\$f21		0
\$f22		0
\$f23		0
\$f24		0
\$f25		0
\$f26		0
\$f27		0
\$f28		0
\$f29		0
\$f30		0
\$f31		0

The bottom pane shows the Data Segment window with the following values:

Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)	Value (+10)	Value (+14)	Value (+18)	Value (+1c)
0x10010000	0	0	0	0	0	0	0	0
0x10010020	0	0	0	0	0	0	0	0
0x10010040	0	0	0	0	0	0	0	0
0x10010060	0	0	0	0	0	0	0	0
0x10010080	0	0	0	0	0	0	0	0
0x100100a0	0	0	0	0	0	0	0	0
0x100100c0	0	0	0	0	0	0	0	0
0x100100e0	0	0	0	0	0	0	0	0
0x10010100	0	0	0	0	0	0	0	0
0x10010120	0	0	0	0	0	0	0	0

The bottom status bar shows "Mars Messages" and "Run I/O". The "Mars Messages" window displays the message "Reset: reset completed." and a "Clear" button.

#move \$s0, \$s1

D:\2023\2\TH KTM\T\MARSfile\Lab4\Assignment_3.asm - MARS 4.5

File Edit Run Settings Tools Help

Run speed at max (no interaction)

Edit **Execute**

Text Segment

Bkpt	Address	Code	Basic	Source
	0x00400000	0x2411ffff	addiu \$17,\$0,-5	4: li \$s1, -5
	0x00400004	0x2412000a	addiu \$18,\$0,10	5: li \$s2, 10
	0x00400008	0x001147c3	sra \$s2,\$s1,31	8: sra \$s2, \$s1, 31 #abs \$s0, \$s1
	0x0040000c	0x01118026	xor \$16,\$17,\$1	9: xor \$s0, \$t0, \$s1
	0x00400010	0x02088023	sra \$16,\$16,\$8	10: sra \$s0, \$s0, \$t0
	0x00400014	0x00100008	j skip	11: j skip
	0x00400018	0x00900064	addi \$9,\$0,100	13: addi \$t1, \$0, 100
	0x0040001c	0x0010000d	j end	14: j end
	0x00400020	0x00118021	addu \$s0,\$0,\$s1	17: addu \$s0, \$0, \$s1 #move \$s0, \$s1
	0x00400024	0x02208027	nor \$16,\$17,\$0	20: nor \$s0, \$s1, \$0 #not \$s0, \$s1
	0x00400028	0x0251502a	slt \$10,\$18,\$17	23: slt \$t2, \$s2, \$s1 #ble \$s1, \$s2, label
	0x0040002c	0x1140ffff	beq \$10,\$0,-6	24: beq \$t2, \$0, label

Labels

Label	Address
label	0x00400018
skip	0x00400020
end	0x00400024

☒ Data ☒ Text

Data Segment

Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)	Value (+10)	Value (+14)	Value (+18)	Value (+1c)
0x10010000	0	0	0	0	0	0	0	0
0x10010020	0	0	0	0	0	0	0	0
0x10010040	0	0	0	0	0	0	0	0
0x10010060	0	0	0	0	0	0	0	0
0x10010080	0	0	0	0	0	0	0	0
0x100100a0	0	0	0	0	0	0	0	0
0x100100c0	0	0	0	0	0	0	0	0
0x100100e0	0	0	0	0	0	0	0	0
0x10010100	0	0	0	0	0	0	0	0
0x10010120	0	0	0	0	0	0	0	0

☒ Hexadecimal Addresses ☐ Hexadecimal Values ☐ ASCII

Mars Messages **Run IO**

Reset: reset completed.

Clear

Reset: reset completed.

Registers **Coproc 1** **Coproc 0**

Name	Number	Value
\$zero	0	0
\$at	1	0
\$v0	2	0
\$v1	3	0
\$a0	4	0
\$a1	5	0
\$a2	6	0
\$a3	7	0
\$t0	8	-1
\$t1	9	0
\$t2	10	0
\$t3	11	0
\$t4	12	0
\$t5	13	0
\$t6	14	0
\$t7	15	0
\$s0	16	-5
\$s1	17	-5
\$s2	18	10
\$s3	19	0
\$s4	20	0
\$s5	21	0
\$s6	22	0
\$s7	23	0
\$s8	24	0
\$t9	25	0
\$k0	26	0
\$k1	27	0
\$gp	28	268468224
\$sp	29	2147475548
\$fp	30	0
\$ra	31	0
\$pc		4194368
\$hi		0
\$lo		0

#not \$s0, \$s1

D:\2023\2\TH KTM\T\MARSfile\Lab4\Assignment_3.asm - MARS 4.5

File Edit Run Settings Tools Help

Run speed at max (no interaction)

Edit **Execute**

Text Segment

Bkpt	Address	Code	Basic	Source
	0x00400000	0x2411ffff	addiu \$17,\$0,-5	4: li \$s1, -5
	0x00400004	0x2412000a	addiu \$18,\$0,10	5: li \$s2, 10
	0x00400008	0x001147c3	sra \$s2,\$s1,31	8: sra \$s2, \$s1, 31 #abs \$s0, \$s1
	0x0040000c	0x01118026	xor \$16,\$17,\$1	9: xor \$s0, \$t0, \$s1
	0x00400010	0x02088023	sra \$16,\$16,\$8	10: sra \$s0, \$s0, \$t0
	0x00400014	0x00100008	j skip	11: j skip
	0x00400018	0x00900064	addi \$9,\$0,100	13: addi \$t1, \$0, 100
	0x0040001c	0x0010000d	j end	14: j end
	0x00400020	0x00118021	addu \$s0,\$0,\$s1	17: addu \$s0, \$0, \$s1 #move \$s0, \$s1
	0x00400024	0x02208027	nor \$16,\$17,\$0	20: nor \$s0, \$s1, \$0 #not \$s0, \$s1
	0x00400028	0x0251502a	slt \$10,\$18,\$17	23: slt \$t2, \$s2, \$s1 #ble \$s1, \$s2, label
	0x0040002c	0x1140ffff	beq \$10,\$0,-6	24: beq \$t2, \$0, label

Labels

Label	Address
label	0x00400018
skip	0x00400020
end	0x00400024

☒ Data ☒ Text

Data Segment

Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)	Value (+10)	Value (+14)	Value (+18)	Value (+1c)
0x10010000	0	0	0	0	0	0	0	0
0x10010020	0	0	0	0	0	0	0	0
0x10010040	0	0	0	0	0	0	0	0
0x10010060	0	0	0	0	0	0	0	0
0x10010080	0	0	0	0	0	0	0	0
0x100100a0	0	0	0	0	0	0	0	0
0x100100c0	0	0	0	0	0	0	0	0
0x100100e0	0	0	0	0	0	0	0	0
0x10010100	0	0	0	0	0	0	0	0
0x10010120	0	0	0	0	0	0	0	0

☒ Hexadecimal Addresses ☐ Hexadecimal Values ☐ ASCII

Mars Messages **Run IO**

Reset: reset completed.

Clear

Reset: reset completed.

Registers **Coproc 1** **Coproc 0**

Name	Number	Value
\$zero	0	0
\$at	1	0
\$v0	2	0
\$v1	3	0
\$a0	4	0
\$a1	5	0
\$a2	6	0
\$a3	7	0
\$t0	8	-1
\$t1	9	0
\$t2	10	0
\$t3	11	0
\$t4	12	0
\$t5	13	0
\$t6	14	0
\$t7	15	0
\$s0	16	-4
\$s1	17	-5
\$s2	18	10
\$s3	19	0
\$s4	20	0
\$s5	21	0
\$s6	22	0
\$s7	23	0
\$s8	24	0
\$t9	25	0
\$k0	26	0
\$k1	27	0
\$gp	28	268468224
\$sp	29	2147475548
\$fp	30	0
\$ra	31	0
\$pc		4194368
\$hi		0
\$lo		0

D:\2023\2\TH KTM\T\MARSFile\Lab4\Assignment_3.asm - MARS 4.5

File Edit Run Settings Tools Help

Run speed at max (no interaction)

Edit Execute

Bkpt	Address	Code	Basic	Source
	0x00400004	0x241200d	addiu \$t8,\$0,10	5: li \$t2, 10
	0x00400008	0x00147f3	sra \$s2,\$t1,\$l	8: sra \$s2, \$s1, \$l #abs \$s0, \$s1
	0x0040000c	0x1118026	nor \$t0,\$t0,\$t1	9: nor \$t0, \$t0, \$t1
	0x00400010	0x0208023	sllw \$t6,\$t6,\$t0	10: sllw \$s0, \$s0, \$t0
	0x00400014	0x08100008	j skip	11: j skip
	0x00400018	0x20090064	addi \$t1,\$0,100	13: addi \$t1, \$0, 100
	0x0040001c	0x0e10000d	asci	14: j end
	0x00400020	0x00118021	addu \$t0,\$0,\$l	17: addu \$s0, \$0, \$l #move \$s0, \$s1
	0x00400024	0x0220027	nor \$t0,\$t0,\$t1	20: nor \$s0, \$s1, \$0 #not \$s0, \$s1
	0x00400028	0x0251502a	sllt \$t0,\$t0,\$t1	23: sllt \$s2, \$s2, \$l #hle \$s1, \$s2, label
	0x0040002c	0x1140ffa	bqz \$t0,\$0,-6	24: bqz \$t2, \$0, label
	0x00400030	0x08100008	j end	25: j end

Labels

Label	Address
Assignment_3.asm	
label	0x00400018
skip	0x00400020
end	0x00400034

☒ Data ☒ Text

Data Segment

Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)	Value (+10)	Value (+14)	Value (+18)	Value (+1c)
0x10010000	0	0	0	0	0	0	0	0
0x10010020	0	0	0	0	0	0	0	0
0x10010040	0	0	0	0	0	0	0	0
0x10010060	0	0	0	0	0	0	0	0
0x10010080	0	0	0	0	0	0	0	0
0x100100a0	0	0	0	0	0	0	0	0
0x100100c0	0	0	0	0	0	0	0	0
0x100100e0	0	0	0	0	0	0	0	0
0x10010100	0	0	0	0	0	0	0	0
0x10010120	0	0	0	0	0	0	0	0

☒ Hexadecimal Addresses ☐ Hexadecimal Values ☐ ASCII

Mars Messages Run IO

Clear
Reset: reset completed.

Registers Coproc 1 Coproc 0

Name	Number	Value
\$zero	0	0
\$at	1	0
\$v0	2	0
\$v1	3	0
\$a0	4	0
\$a1	5	0
\$a2	6	0
\$a3	7	0
\$a4	8	0
\$t1	9	0
\$t2	10	0
\$t3	11	0
\$t4	12	0
\$t5	13	0
\$t6	14	0
\$t7	15	0
\$a0	16	4
\$a1	17	-5
\$a2	18	10
\$a3	19	0
\$a4	20	0
\$a5	21	0
\$a6	22	0
\$a7	23	0
\$t8	24	0
\$t9	25	0
\$t0	26	0
\$t1	27	0
\$fp	28	268468224
\$sp	29	2147475548
\$gp	30	0
\$ra	31	0
\$pc		4194348
\$hi		0
\$lo		0

D:\2023\2\TH KTM\T\MARSFILE\Lab4\Assignment_3.asm - MARS 4.5

File
Edit
Run
Settings
Tools
Help

Run speed at max (no interaction)

Edit

Execute

Text Segment

Bkpt	Address	Code	Basic	Source
	0x00400004	0x2412000a	addiu \$18,\$0,10	5: li \$a2, 10
	0x00400008	0x00114763	sra \$s1,\$17,\$1	8: sra \$s0, \$s1, \$1 #a2 \$s0, \$s1
	0x0040000c	0x1118026c	nor \$10,\$0,\$17	9: nor \$s0, \$s0, \$s1
	0x00400010	0x2089023	subu \$16,\$16,\$2	10: subu \$s0, \$s0, \$s0
	0x00400014	0x08100008	j 0x00400020	11: j skip
	0x00400018	0x20090064	addi \$9,\$0,100	13: addi \$t1, \$0, 100
	0x0040001c	0x0810000d	0x00400034	14: j end
	0x00400020	0x0018001d	addu \$16,\$0,\$17	17: addu \$s0, \$0, \$s1 #more \$s0, \$s1
	0x00400024	0x02208027	nor \$16,\$17,\$0	20: nor \$s0, \$s1, \$0 #not \$s0, \$s1
	0x00400028	0x0251502a	slt \$10,\$18,\$17	23: slt \$t2, \$s2, \$s1 #b1e \$s1, \$s2, label
	0x0040002c	0x1140fffa	bqz \$10,\$0,-6	24: bqz \$t2, \$0, label
	0x00400030	0x0810000d	0x00400034	25: j end

Labels

Label	Address
Assignment_3.asm	
label	0x00400018
skip	0x00400020
end	0x00400034

☒ Data
☒ Text

Data Segment

Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)	Value (+10)	Value (+14)	Value (+18)	Value (+1c)
0x10010000	0	0	0	0	0	0	0	0
0x10010008	0	0	0	0	0	0	0	0
0x10010040	0	0	0	0	0	0	0	0
0x10010060	0	0	0	0	0	0	0	0
0x10010080	0	0	0	0	0	0	0	0
0x100100a0	0	0	0	0	0	0	0	0
0x100100c0	0	0	0	0	0	0	0	0
0x100100e0	0	0	0	0	0	0	0	0
0x10010100	0	0	0	0	0	0	0	0
0x10010120	0	0	0	0	0	0	0	0

☒ 0x10010000 (data)
☒ Hexadecimal Addresses
☐ Hexadecimal Values
☐ ASCII

Registers

Name	Number	Value
\$zero	0	0
\$at	1	0
\$v0	2	0
\$v1	3	0
\$a0	4	0
\$a1	5	0
\$a2	6	0
\$a3	7	0
\$s0	8	0
\$s1	9	0
\$t2	10	0
\$t3	11	0
\$t4	12	0
\$t5	13	0
\$t6	14	0
\$t7	15	0
\$a0	16	4
\$a1	17	-5
\$a2	18	10
\$a3	19	0
\$a4	20	0
\$a5	21	0
\$a6	22	0
\$a7	23	0
\$t8	24	0
\$t9	25	0
\$t0	26	0
\$t1	27	0
\$gp	28	268468224
\$sp	29	2147475948
\$fp	30	0
\$ra	31	0
\$pc		4194328
\$hi		0
\$lo		0

Mars Messages

Run IO

Reset: reset completed.

Clear

Reset: reset completed.

Code:

#Lab 4, Assignment 4

.text

```
li $s0, -2
```

li \$s1, -2147483647

```
li $t7, 0      #Overflow flag
```

```
addu $s2, $s0, $s1    #SUM
```

```

xor $t0, $s0, $s1
bltz $t0, END      #If different sign -> END

```

```

xor $t1, $s0, $s2  #If same sign -> Check overflow
bgztz $t1, END

```

```

#Overflow
addi $t7, $t7, 1

```

END:

Result:

```

- Testcase:
  li $s0, -2
  li $s1, -2147483647

```

The screenshot shows the MARS 4.5 IDE interface. The main window displays assembly code with the following instructions:

```

0x00400000: 0x2410ffff,addiu $t6,$0,-2      4:      li $s0, -2
0x00400004: 0x3c018000,lui $1,-32768        5:      li $s1, -2147483647
0x00400008: 0x34910001,ori $t7,$t1,1        6:      li $t7, 0          #overflow flag
0x0040000c: 0x240f0000,addiu $t5,$0,0        8:      addu $s2, $s0, $s1  #SUM
0x00400014: 0x02114026,xor $s,$t6,$t7       10:     xor $s0, $s0, $s1
0x00400018: 0x05000003,bltz $s,$3           11:     bltz $t0, END      #if different sign -> END
0x0040001c: 0x02124826,xor $s,$t6,$t7       13:     xor $t1, $s0, $s2  #if same sign -> Check o...
0x00400020: 0x1d200001,byte $s,$1           14:     byte $t1, END
0x00400024: 0x21ef0001,addi $t5,$t5,1       17:     addi $t7, $t7, 1

```

The Registers window on the right shows the state of the registers:

Name	Number	Value
\$zero	0	0
\$at	1	-2147483648
\$v0	2	0
\$v1	3	0
\$a0	4	0
\$a1	5	0
\$a2	6	0
\$a3	7	0
\$t0	8	-2147483647
\$t1	9	-2147483647
\$t2	10	0
\$t3	11	0
\$t4	12	0
\$t5	13	0
\$t6	14	0
\$t7	15	1
\$s0	16	-2
\$s1	17	-2147483647
\$s2	18	-2147483647
\$s3	19	0
\$s4	20	0
\$s5	21	0
\$s6	22	0
\$s7	23	0
\$s8	24	0
\$s9	25	0
\$k0	26	0
\$k1	27	0
\$gp	28	268460224
\$sp	29	2147479540
\$fp	30	0
\$ra	31	0
pc		4194366
hi		0
lo		0

The Data Segment window shows memory addresses and their corresponding values in various formats (Value (+0), Value (+4), Value (+8), Value (+c), Value (+10), Value (+14), Value (+18), Value (+1c)).

The MARS Messages window shows the following messages:

```

Reset: reset completed.
-- program is finished running (dropped off bottom) --

```

- Testcase:
 li \$s0, 1
 li \$s1, 2147483646

Text Segment

Offset	Address	Code	Basic	Source
0x00400000	0x24100001	addiu \$16,\$0,1	4:	li \$s0, 1
0x00400004	0x3c017fff	lui \$1,32767	5:	li \$s1, 2147483646
0x00400008	0x3431ffff	ori \$17,\$1,65534		
0x0040000c	0x240f0000	addiu \$15,\$0,0	6:	li \$t7, 0 #overflow flag
0x00400010	0x02119001	addu \$18,\$16,\$17	9:	addu \$s2, \$s0, \$s1 #sum
0x00400014	0x02114026	xor \$t0,\$16,\$17	10:	xor \$t0, \$s0, \$s1
0x00400018	0x05000003	bltz \$t0,3	11:	bltz \$t0, END #if different sign -> END
0x0040001c	0x02124836	xor \$t1,\$s0,\$s2	13:	xor \$t1, \$s0, \$s2 #if name sign -> Check o..
0x00400020	0x14000001	byte \$t1,END	14:	byte \$t1, END
0x00400024	0x21ef0001	addi \$s7,\$15,1	17:	addi \$s7, \$t7, 1

Data Segment

Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)	Value (+10)	Value (+14)	Value (+18)	Value (+1c)
0x10010000	0	0	0	0	0	0	0	0
0x10010020	0	0	0	0	0	0	0	0
0x10010040	0	0	0	0	0	0	0	0
0x10010060	0	0	0	0	0	0	0	0
0x10010080	0	0	0	0	0	0	0	0
0x100100a0	0	0	0	0	0	0	0	0
0x100100c0	0	0	0	0	0	0	0	0
0x100100e0	0	0	0	0	0	0	0	0
0x10010100	0	0	0	0	0	0	0	0
0x10010120	0	0	0	0	0	0	0	0

Registers

Name	Number	Value
\$zero	0	0
\$at	1	2147481812
\$v0	2	0
\$v1	3	0
\$a0	4	0
\$a1	5	0
\$a2	6	0
\$a3	7	0
\$t0	8	2147483647
\$t1	9	2147483646
\$t2	10	0
\$t3	11	0
\$t4	12	0
\$t5	13	0
\$t6	14	0
\$t7	15	0
\$s0	16	1
\$s1	17	2147483646
\$s2	18	2147483647
\$s3	19	0
\$s4	20	0
\$s5	21	0
\$s6	22	0
\$s7	23	0
\$s8	24	0
\$s9	25	0
\$k0	26	0
\$k1	27	0
\$gp	28	268468224
\$ap	29	2147479548
\$fp	30	0
\$ra	31	0
\$pc		4194344
\$hi		0
\$lo		0

MARS Messages

```
-- program is finished running (dropped off bottom) --
```

Assignment 5

Code:

#Lab 4, Assignment 5

.text

```
li $s0,1          #s0=1
sll $s1,$s0, 4    #s1=s0*16
```

Result:

Text Segment

Offset	Address	Code	Basic	Source
0x00400000	0x24100001	addiu \$16,\$0,1	3:	li \$s0,1 #s0=1
0x00400004	0x00108900	sll \$s1,\$s0,4	4:	sll \$s1,\$s0, 4 #s1=s0*16

Data Segment

Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)	Value (+10)	Value (+14)	Value (+18)	Value (+1c)
0x10010000	0	0	0	0	0	0	0	0
0x10010020	0	0	0	0	0	0	0	0
0x10010040	0	0	0	0	0	0	0	0
0x10010060	0	0	0	0	0	0	0	0
0x10010080	0	0	0	0	0	0	0	0
0x100100a0	0	0	0	0	0	0	0	0
0x100100c0	0	0	0	0	0	0	0	0
0x100100e0	0	0	0	0	0	0	0	0
0x10010100	0	0	0	0	0	0	0	0
0x10010120	0	0	0	0	0	0	0	0

Registers

Name	Number	Value
\$zero	0	0
\$at	1	0
\$v0	2	0
\$v1	3	0
\$a0	4	0
\$a1	5	0
\$a2	6	0
\$a3	7	0
\$t0	8	0
\$t1	9	0
\$t2	10	0
\$t3	11	0
\$t4	12	0
\$t5	13	0
\$t6	14	0
\$t7	15	0
\$s0	16	1
\$s1	17	16
\$s2	18	0
\$s3	19	0
\$s4	20	0
\$s5	21	0
\$s6	22	0
\$s7	23	0
\$s8	24	0
\$s9	25	0
\$k0	26	0
\$k1	27	0
\$gp	28	268468224
\$ap	29	2147479548
\$fp	30	0
\$ra	31	0
\$pc		4194312
\$hi		0
\$lo		0

MARS Messages

```
-- program is finished running (dropped off bottom) --
```