

# ECE3073 Computer Systems

## Practice Questions

### NIOS Assembler

i) For the NIOS processor give the common use of the following registers:

**Always returns the value zero**

a) r0 .....

**Assembler temporary used exclusively in pseudo ops**

b) r1 .....

**Return address associated with function calls**

c) r32 .....

ii) Which NIOS processor register contains the interrupt enable bit?

**ctl0**

.....

Which bit in the register is the interrupt enable bit?

**Bit 0**

.....

iii) In NEOS machine code instructions which bits contain the op-code?

**Bits 0 to 5**

.....

iv) In a NIOS assembler branch instruction the 16-bit immediate constant contains which of the following? (mark the correct answer with a cross)

a) an unsigned byte offset .....

b) an unsigned word offset .....

c) a signed byte offset .....**X**

d) a signed word offset .....

**v)** In a NIOS assembler j type instruction such as jmpj the IMM26 26-bit immediate constant contains which of the following? (mark the correct answer with a cross)

a) a byte offset .....

b) a word offset .....

c) a byte address .....

d) a word address ..... **X**

vi) The NIOS assembler instruction `sub rA, rB, rC` performs which operation? (mark the correct answer with a cross)

- a)  $rA = rB - rC$  .....**X**  
 b)  $rC = rA - rB$  .....  
 a)  $rC = rB - rA$  .....

vii) In Neos assembler what is the difference between:

`stw r4, 0(r5)`                      and  
`stwio r4, 0(r5)`

**stw transfers the contents of r4 to cache memory**  
**stwio transfers the contents of r4 to memory (or memory mapped I/O) bypassing the cache.**

viii) Convert the following Nios machine code instructions to assembler.

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	0	1	1	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	0

Instruction	operands
<b>bge</b>	<b>r22, r5, -16</b>

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	1	1	0	0	0	0	0	0	1	1	1	1	1	0	1	1	1	0	1	0	0	0	0	0	1	1	1	0	1	0

Instruction	operands
<b>callr</b>	<b>r6</b>

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	1	0	0	1	0	1	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	0	1	1	0	0

Instruction	operands
<b>andi</b>	<b>r11, r2, 0x5555</b>

**Q4.3 (6 marks)** Convert the following Nios assembler code instructions to machine code (write your answers in the boxes provided).

Instruction	operands
<b>mul</b>	<b>r6, r12, r1</b>

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	1	1	0	0	0	0	0	0	1	0	0	1	1	0	1	0	0	1	1	1	0	0	0	0	0	1	1	1	0	1	0

Instruction	operands
jmp	0x87654320 /* this instruction is at address 0x80000000 */

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	1	1	1	0	1	1	0	0	1	0	1	0	1	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	1

Instruction	operands
srli	r9, r3, 6

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	1	1	0	0	0	0	0	0	1	0	0	1	0	1	1	0	1	0	0	0	1	1	0	1	1	1	0	1	0

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