**CDA3100 Midterm Exam, Fall 2011**

Name :

***Instructions:***

1. *This is a close-book and close-notes exam.*
2. *You have* ***75*** *minutes to answer the questions.*
3. *Please write down your name on the top of this page first before you start answering any question. Answer all questions directly on the exam papers. If you need additional sheets, please let me know.*
4. *Partial credit is possible for an answer. However, please try to be concise and make your exam as neat as possible.*

**Part I. Multiple choice questions.**

Please select one answer for each question by circling the index of the answer. **8** points for each question. You may also write down a short sentence in the provided space to explain your choice. If your choice is wrong but your explanation is partially correct, partial credit will be given.

1. What is the binary representation for 56010 in 16 bits?

(a) 0000 0010 0011 0000

(b) 0000 0100 0011 0000

(c) 0000 0010 0101 0100

(d) None of the above.

512+48, a

1. What is the two’s complement binary representation for -6610 in 8 bits?

(a) 1001 1100

(b) 1011 1111

(c) 1011 1110

(d) None of the above.

c. 66-> 64+2->01000010->10111101->10111110

1. What is 22.2510 represented as a single precision floating point number?

(a) 1 10000001 101 1101 0000 0000 0000 0000

(b) 0 10000011 011 0010 0000 0000 0000 0000

(c) 0 10000100 111 0100 0000 0000 0000 0000

(d) None of the above.

22.25->10110.01->1.011001\*2^4

0 10000011 011 0010 0000 0000 0000 0000

b

1. Suppose $t0 is storing 10, $t1 is storing 20. After the following instructions, what will be the value in $t2?

sub $t2, $t0, $t1

ori $t2, $t0, 3

 xor $t2, $t2, $t1

(a) 31

(b) 20

(c) 11

(d) None of the above.

Answer: a 31.

1. Suppose word array A stores 0,1,2,3,4,5,6,7,8,9, in this order. Assume the starting address of A is in $s0. After the following instructions, what will be the values this array?

 addi $t0, $s0, 32

 lw $t1, 0($t0)

 sw $t1, 4($t0)

(a) 0,1,2,3,4,5,6,7,8,9

(b) 0,1,2,3,4,5,6,7,9,9

(c) 0,1,2,3,4,5,6,7,8,8

(d) None of the above.

c

1. Suppose $t0 and $t1 are holding 10 and 5, respectively. After the following instructions, what will be in $t0?

slt $t0, $t0, $t1

bne $t0, $0, p6L1

sll $t0, $t1, 2

j p6L1

 p6L1: addi $t0, $t0, 1

(a) 1

(b) 20

(c) 21

(d) None of the above.

 c

1. Suppose word array A stores 0,1,2,3,4,5,6,7,8,9, in this order. Assume the starting address of A is currently in $s0. After the following instructions, what will be the value in $t1?

ori $t0, $0, 6

p7L0: lw $t1, 0($s0)

sll $t1, $t1, 2

blt $t0, $t1, p7L1

 addi $s0, $s0, 4

 j p7L0

 p7L1:

(a) 2

(b) 3

(c) 6

(d) None of the above.

d. should be 8

1. After the following instructions are executed, what will be the value in $t0?

 li $t0, 10

li $a0, 17

jal p8fun

 addi $t0, $v0, 10

 addi $t0, $t0, 10

 …

p8fun: addi $v0, $a0, 3

addi $ra, $ra, 4

 jr $ra

(a) 20

(b) 30

(c) 40

(d) None of the above.

a

1. Which of the following statements about MIPS interrupt is true?

(a) An interrupt handler has to save $ra.

(b) An interrupt can be triggered only when executing certain instructions.

(c) Both of the above.

(d) None of the above.

d

1. Suppose a function P10\_funct0 calls P10\_funct1 shown below, while P10\_funct0 is written according to MIPS conventions and has no bugs. Which of the following statements is true?

P10\_funct1:

 addi $sp, $sp, -4

 sw $ra, 0($sp)

 jal P10\_funct2

 lw $ra, 0($sp)

 jr $ra

(a) P10\_funct1 can return to P10\_funct0 correctly.

(b) P10\_funct0 cannot return to its caller correctly.

(c) Both of the above.

(d) None of the above.

c

**Part II. Short answer questions**

1. (**10** points) Please read the following code and write down the content in array A after funct returns.

Finds the smallest difference

 .data

A: .word 21,3,2,9,100,22,6,15,33,90

 .text

 .globl main

main:

 la $a0, A

 li $a1, 17

 li $a2, 10

 jal funct

 li $v0, 10 # exit

 syscall

funct:

 li $t0, 0

 li $v1, 1000000

funct\_L0:

 sll $t1, $t0, 2

 add $t1, $t1, $a0

 lw $t1, 0($t1)

 sub $t2, $t1, $a1

 bgt $t2, $0, funct\_L1

 sub $t2, $0, $t2

funct\_L1:

 bgt $t2, $v1, funct\_L2

 ori $v0, $t0, 0

 ori $v1, $t2, 0

funct\_L2:

 addi $t0, $t0, 1

 blt $t0, $a2, funct\_L0

 jr $ra

1. (**10** points) Write a **complete** function called “F1” that takes in $a0 a number and return in $v0 the location of the most significant 1**.**

**In this problem, the number passed in $a0 will never be 0.**

For example, if the $a0 is 30, it should return 4 because 30 in binary is “00000000000000000000000000011110” and we index the locations as bit 0 to bit 31.

Please note that

* You do not have to save $a0 in your function.
* **If more than 5 instructions are used for this function, 2 points will be deducted for each additional instruction until no more points are left**. Keep in mind that some pseudo instructions may result in more than one real instruction and the number of real instructions will be counted.

F1: addi $v0, $0, -1

F1\_L1:addi $v0, $v0, 1

srl $a0, $a0, 1

bne $a0, $0, F1\_L1

jr $ra