NOMBRE: _____ **SECCION** _____

¡Anota tu nombre completo en esta página y tus iniciales en <u>todas las demás hojas</u> del examen AHORA! (penalidad de 5 puntos)

Tienes 2 horas para completar todos los problemas. Lee cuidadosamente todo el examen antes de empezar a trabajar. Muestra todo el trabajo conducente a tu contestación. Podrás recibir crédito parcial por contestaciones parciales siempre y cuando muestres tu trabajo por escrito. Usa tu tiempo inteligentemente. Exito!

ICOM 4036 Staff

1	25
2	40
3	25
4	10
Total	100

Problem 1. (25 points) Pseudo vs Native MIPS

1. **(5 pts each) Match each of the following MIPS pseudo-instructions with ONE corresponding equivalent sequence of native instructions. Write the letter corresponding to the native sequence next to its equivalent pseudo-instruction. Please refer to the appendix for the complete set of MIPS instructions and their descriptions.**

Pseudo-Instruction	Native Sequence
___ move $s1, $s2	a. addi $s1, $zero, 0
___ sle $s1, $s2, $s3	b. beq $s1, $zero, foo beq $s1, $s1, loop foo:
___ bnez $s1, loop	c. sub $s1, $zero, $s2
___ li $s1, 0	d. addi $s1, $s2, 0
___ neg $s1, $s2	e. bgt $s2, $s3, foo addi $s1, $zero, 1 beq $s1, $s1, bar foo: addi $s1, $zero, 0 bar:
	f. bgt $s2, $s3, foo addi $s1, $zero, 0 beq $s1, $s1, bar foo: addi $s1, $zero, 1 bar:
	g. sub $zero, $s2, $s1

Problem 2. (40 points) High-level programming language implementation

Consider the following segment of C code:

```
int f1 = 0;
int f2 = 1;
int fn = 0;

for (int i=0; i<n; i++) {
     fn = f1 + f2;
     f1 = f2;
     f2 = fn;
}
```

(a) (10 points) What will be the value of variable *fn* at the end of the segment assuming that the value of *n* is 5

(b) (15 points) Provide an equivalent program segment in MIPS assembly language

```
          .data
f1:       .word     0
f2:       .word     1
fn:       .word     0
          .text
```

(c) (15 points) Provide an equivalent program segment in Easy I assembly language. You must assign memory locations for each of the variables f1, f2 and fn.

Problema 3. (25 points) Low-level / High-level equivalence

1. **(5 pts each)** Match each of the following C code segments with ONE corresponding and shortest equivalent sequence of MIPS instructions. Write the letter corresponding to the MIPS sequence next to its equivalent C code segment. You may assume the existence of a MIPS label that you can use to refer to the word-size memory cell where each high level variable is allocated. The label has the same name as the corresponding variable. Please refer to the appendix for the complete set of MIPS instructions and their descriptions.

C Code	MIPS Assembly

___ x = 0;	**a.**
	la $t0, x
	lw $s0, 0($t0)
	li $s1, 1
	add $s0, $s0, $s1

___ x = x + 1;	**b.**
	li $s1, 10
	la $t0, x
	lw $s0, 0($t0)
	loop:
	add $s0, $s0, -1
	bgt $s1, $s0, exit
	b loop
	exit: sw $s0, 0($t0)

___ while (x<10) { x--; }	**c.** sw x, $zero

___ while (x>=10) { x--; }	**d.**
	li $s1, 10
	la $t0, x
	lw $s0, 0($t0)
	loop:
	add $s0, $s0, -1
	bge $s0, $s1, exit
	b loop
	exit: sw $s0, 0($t0)

___ while (true) { x--; }	**e.**
	la $t0, x
	lw $s0, 0($t0)
	li $s1, 1
	sub $s0, $s0, $s0
	sw $s0, 0($t0)

	f.
	la $t0, x
	lw $s0, 0($t0)
	li $s1, 1
	add $s0, $s0, $s1
	sw $s0, 0($t0)

	g.
	li $s1, 10
	la $t0, x
	lw $s0, 0($t0)
	loop:
	add $s0, $s0, -1
	blt $s1, $s1, exit
	b loop
	exit: sw $s0, 0($t0)

Problem 4. (10 points) Course Evaluation

Es importante que completes esta parte con la mayor seriedad e interés posibles. Tu contribución ayudará a mejorar la calidad del curso significativamente.

Gracias.

1) Menciona los tres aspectos que mas te gustan de la clase ICOM 4036

a)

b)

c)

2) Menciona los tres aspectos que menos te gustan de la clase ICOM 4036

a)

b)

c)