

## Assignment 2

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2.1 [5] <§2.2> For the following C statement, what is the corresponding MIPS assembly code? Assume that the variables f, g, h, and i are given and could be considered 32-bit integers as declared in a C program. Use a minimal number of MIPS assembly instructions.

$f = g + (h - 5);$

```
sub i,h,5
```

```
add f,g,i
```

2.3 [5] <§§2.2, 2.3> For the following C statement, what is the corresponding MIPS assembly code? Assume that the variables f, g, h, i, and j are assigned to registers \$s0, \$s1, \$s2, \$s3, and \$s4, respectively. Assume that the base address of the arrays A and B are in registers \$s6 and \$s7, respectively.

$B[8] = A[i-j];$

```
sub $t0, $s3, $s4
```

```
sll $t0, $t0, 2
```

```
add $t1, $t0, $s6
```

```
sw $t1, 32($s7)
```

2.4 [5] <§§2.2, 2.3> For the MIPS assembly instructions above, what is the corresponding C statement? Assume that the variables f, g, h, i, and j are assigned to registers \$s0, \$s1, \$s2, \$s3, and \$s4, respectively. Assume that the base address of the arrays A and B are in registers \$s6 and \$s7, respectively.

```
sll    $t0, $s0, 2      # $t0 = f * 4
add    $t0, $s6, $t0    # $t0 = &A[f]
sll    $t1, $s1, 2      # $t1 = g * 4
add    $t1, $s7, $t1    # $t1 = &B[g]
lw     $s0, 0($t0)      # f = A[f]
addi   $t2, $t0, 4
lw     $t0, 0($t2)
add    $t0, $t0, $s0
sw     $t0, 0($t1)
```

$f=A[f];$

```
f=A[f+1]+A[f];
```

```
B[g]=f;
```

2.15 [5] <§2.4, 2.5> Provide the type and hexadecimal representation of following instruction: sw \$t1, 32 \$t2)

I-Type : used by the immediate and data transfer instructions

machine code:

```
101011 01010 01001 00000 00000 100000
```

hex:

```
0xAD490020
```

2.17 [5] <§2.5> Provide the type, assembly language instruction, and binary representation of instruction described by the following MIPS fields:

op=0x23, rs=1, rt=2, const=0x4

I type

```
lw $v0, 4($at)
```

```
100011 00001 00010 0000000000000100
```

2.26 Consider the following MIPS loop:

```
LOOP: slt $t2, $0, $t1
      beq $t2, $0, DONE
      subi $t1, $t1, 1
      addi $s2, $s2, 2
      j LOOP
DONE:
```

**\*\*2.26.1 [5] <§2.7> Assume that the register \$t1 is initialized to the value 10. What is the value in register \$s2 assuming the \$s2 is initially zero? \*\***

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**\*\*2.26.2 [5] <§2.7> For each of the loops above, write the equivalent C code routine. Assume that the registers \$s1, \$s2, \$t1, and \$t2 are integers A, B, i, and temp, respectively. \*\***

```
for (int i = 10; i > 0; i--)
{
```

```
B+=2;  
}
```

**\*\* 2.26.3 [5] <\$2.7>** For the loops written in MIPS assembly above, assume that the register \$t1 is initialized to the value N. How many MIPS instructions are executed? **\*\***

number of statements\*number of iterations+ number of conditionals

$$5*10+2=52$$