HW#4 (CSC390)

Due: 02/16/2018 by **11:00PM**

(**Please turn in your code on the Blackboard**)

#Q1.

Write a MIPS assembly language program that calls a procedure, Add_Sub_Mul, which accept four parameters (g,h,i,j) and returns,

f = (g+h) if i >j; f= (g-h) if i < j; and f = g*h if i == j; the equivalent C function is shown below:

```
        int Add_Sum_Mul (int g, int h, int i, int j) {
          int f;
         if  (i > j) {
                  f=(g+h);}
          else if (i < j) {
                  f=(g-h);}
         else if (i==j){
                 f=g*h}
        else { f=0;}
    }
```

Consider the variables g, h, i, j and f are initialized with some initial values in the data segment. Use $s0 as f in the function and also use $s0 to store the base address of f in the memory location. Clearly comment on the every instruction you use in your program. Specially, clearly show and describe the stack operation. Remember, resisters ($a0-$a2) are used for passing arguments in to the function and $v resisters are used to store the results in the function.

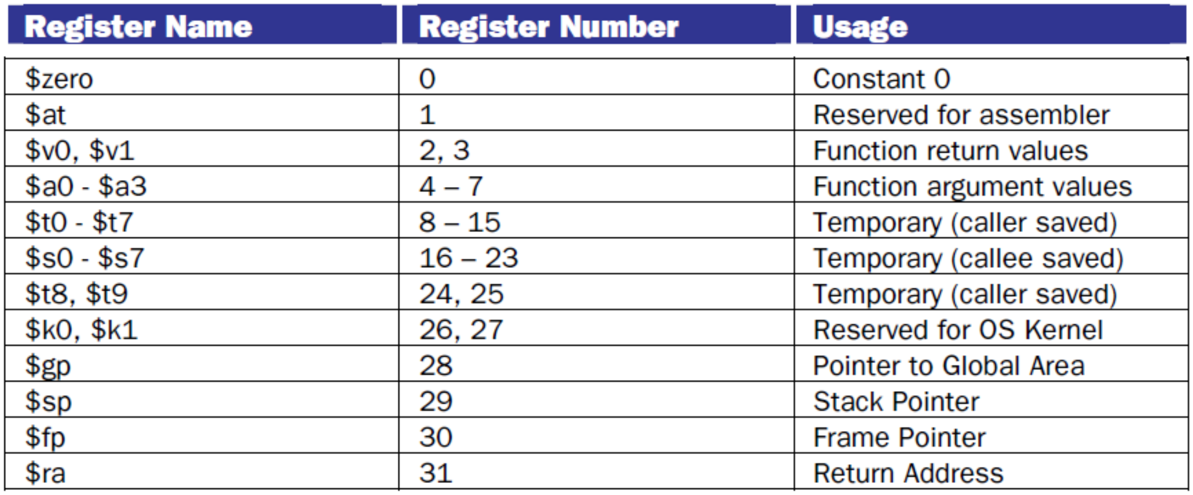
#Q2.

Convert the C function below to MIPS assembly language. Also write a MIPS assembly code to call the function with some initial value of n and store the result in a suitable memory location, labeled as result. Make sure that your assembly language code could be called from a standard C program (that is to say, make sure you follow the MIPS calling conventions).

```
unsigned int sum(unsigned int n)
{
if (n == 0) return 0;
else return n + sum(n-1);
```

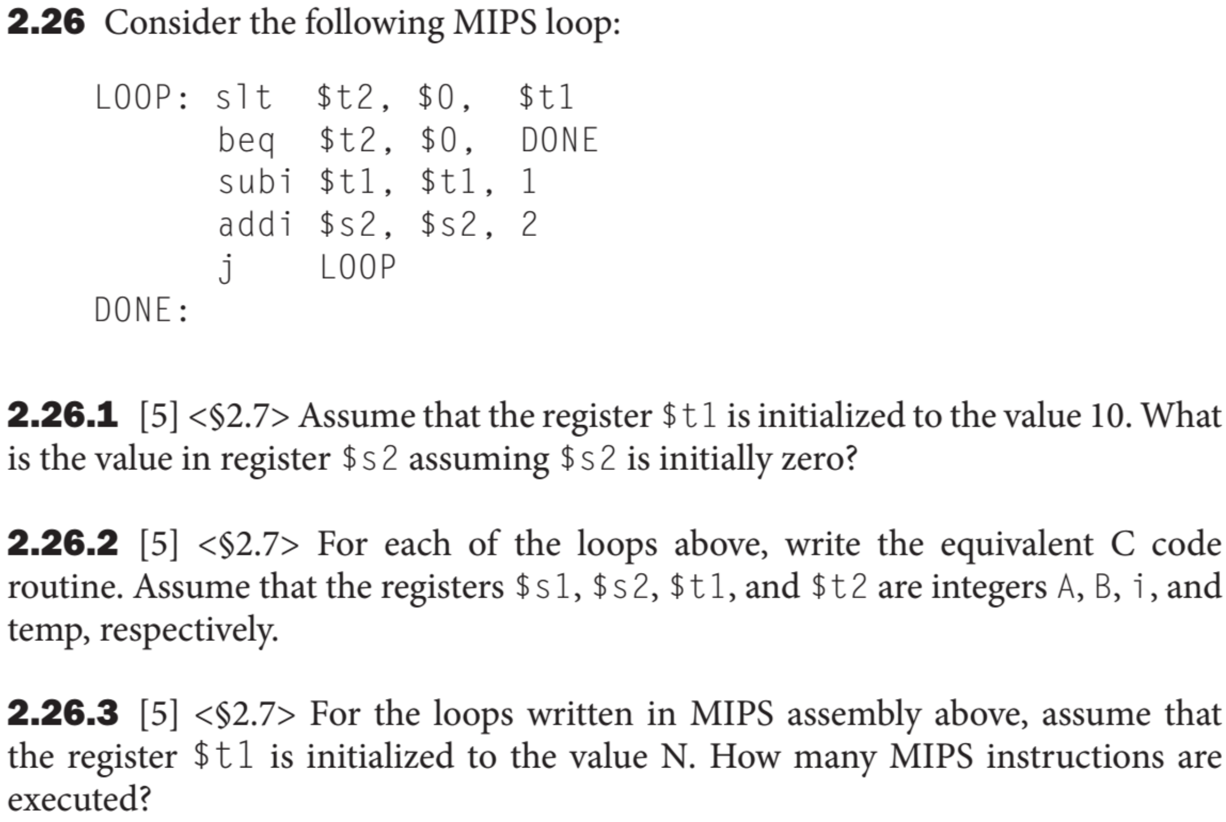
}

This machine has no delay slots. The stack grows downward (toward lower memory addresses). The following registers are used in the calling convention:



Register Name	Register Number	Usage
$zero	0	Constant 0
$at	1	Reserved for assembler
$v0, $v1	2, 3	Function return values
$a0 - $a3	4 – 7	Function argument values
$t0 - $t7	8 – 15	Temporary (caller saved)
$s0 - $s7	16 – 23	Temporary (callee saved)
$t8, $t9	24, 25	Temporary (caller saved)
$k0, $k1	26, 27	Reserved for OS Kernel
$gp	28	Pointer to Global Area
$sp	29	Stack Pointer
$fp	30	Frame Pointer
$ra	31	Return Address

Q3. [Q2.26 of your text book];



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 `$s2` is initially zero?

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.

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?