Homework Assignment 3

(Due 2:10pm, Oct. 4, email to daehyun.kim@wsu.edu or submit a hardcopy)

You can use the following instructions only for this homework.

- Instructions
  - ADD R$, R%, R&
  - ADD R$, R%, #imm
  - SUB R$, R%, R&
  - SUB R$, R%, #imm
  - AND R$, R%, R& // logical AND
  - AND R$, R%, #imm
  - ORR R$, R%, R& // logical OR
  - ORR R$, R%, #imm
  - EOR R$, R%, R& // logical XOR
  - EOR R$, R%, #imm
  - CMP R$, R%
  - CMP R$, #imm
  - BGE, BLT, BGT, BLE, BEQ, BNE, B
  - MOV R$, R% // R$ = R%
  - MOV R$, #imm

1. (20 points) Make an assembly code for the following C code.

```
int a, b, c;

switch ( a ) {
  case 0: b++; c++; break;
  case 1: b++; c--; break;
  case 2: b--; c++; break;
  default: b--; c--; break;
}
```

- Assume that a is R0, b is in R1, and c is in R2.
- The exit point (the end of the switch statement) could be just an address label.

```
CMP R0, #0

BNE check_case1

ADD R1, R1, #1

ADD R2, R2, #1

B switch_end
```

```
check_case1:
        CMP R0, #1
        BNE check_case2
        ADD R1, R1, #1
        SUB R2, R2, #1
        B switch_end
check_case2:
        CMP R0, #2
        BNE case3
        SUB R1, R1, #1
        ADD R2, R2, #1
        B switch_end
case3:
        SUB R1, R1, #1
        SUB R2, R2, #1
switch_end:
```

2. (30 points) Make an assembly code for the following C code.

```
int a, b, c;

for ( a = 0 ; a < 10 ; a = a + 2 ) {
  b++;

  if ( a < b )
    c++;
  else
    c--;

  if ( c == 3 )
    break;
}
```

- Assume that a is R0, b is in R1, and c is in R2.
- The exit point (the end of the switch statement) could be just an address label.

```
        MOV R0, #0          // a = 0
for_loop:
        CMP R0, #10
        BGE for_end         // if ( a >= 10 ), exit
        ADD R1, R1, #2      // b++
        CMP R0, R1
        BLT if_ab
        SUB R2, R2, #1      // c—
        B if_cmp
if_ab:  // if ( a < b )
        ADD R2, R2, #1      // c++
if_cmp:
        CMP R2, #3
        BEQ for_end
        ADD R0, R0, #2      // a = a + 2
        B for_loop
for_end:
```

3. (40 points) Make an assembly code for the following C code.

```
int a, b, c, n;

// start from here
c = 0;
b = 1;
a = 1;
n = 2;

while ( n < 10 ) {
  n++;
  c = b;
  b = a;
  a = b + c;
}
```

- Assume that a is R0, b is in R1, c is in R2, and n is in R3.
- The exit point (the end of the switch statement) could be just an address label.

Question: what's the value of R0 when the program finishes?

```
        MOV R2, #0
        MOV R1, #1
        MOV R0, #1
        MOV R3, #2
while_loop:
        CMP R3, #10
        BGE end
        ADD R3, R3, #1
        MOV R2, R1
        MOV R1, R0
        ADD R0, R1, R2
        B while_loop
end:
```