Lab01 Report

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1 Procedures

1. Load n from the memory.
2. Determine whether n is odd. If not, flip all bits and add one to get the 2's complement representation of $-n$.
3. Flip all bits of n. Then we need to count 1.
4. Multiply 1_{two} by 2_{ten} to get a number with only one bit 1.
5. Repeat the process and perform bit-wise AND for 16 times.
6. If the bit-wise AND operation gives positive number, it means the corresponding bit is 1. Otherwise, it is 0.
7. Add the last number of Student ID 3 to the result.
8. Store the results.

2 Code

```
0011 0000 0000 0000   ; starts at memory x3000
0010 001 011111111    ; load the content of memory x3100 into R1
0101 010 010 1 00000  ; clear R2
0101 011 011 1 00000  ; clear R3
0101 100 100 1 00000  ; clear R4
0001 100 100 1 01000  ; set R4 as 8
0001 100 100 1 01000  ; set R4 as 16
0101 110 110 1 00000  ; clear R6
0001 010 010 1 00001  ; set R2 as 1
0101 101 101 1 00000  ; clear R5
0101 101 001 0 00 010 ; R5 <- R1 AND R2
0000 001 000000010    ; if not positive, take the 2's complement
1001 001 001 111111   ; take the negative of R1
0001 001 001 1 00001  ; R1 plus 1
1001 001 001 111111   ; NOT R1
0101 101 001 0 00 010 ; R5 <- R1 AND R2
```

```
0000 010 000000001    ; if zero, the corresponding bit is zero
0001 011 011 1 00001  ; R3 plus 1
0001 010 010 0 00 010 ; multiply R2 by 2
0001 100 100 1 11111  ; R4 substracts 1
0000 001 111111010    ; if positive, repeat
0001 110 110 1 00011  ; set R6 as 3
0001 011 011 0 00 110 ; R3 <- R3 + R6
0011 110 011101010    ; store the content of R6 into memory x3101
0011 011 011101010    ; store the content of R3 into memory x3102
1111 0000 00100101    ; HALT
```

3 Results

Test the program 5 times with input respectively 5, 100, 24, 524, 2005. Results are as follows.

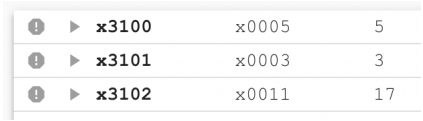

Figure 1: Test with 5

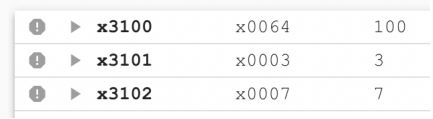

Figure 2: Test with 100

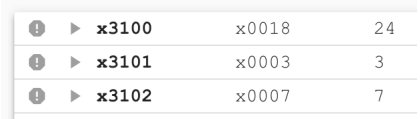

Figure 3: Test with 24

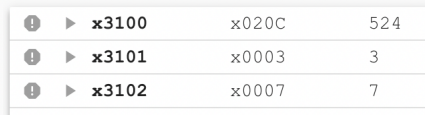

Figure 4: Test with 524

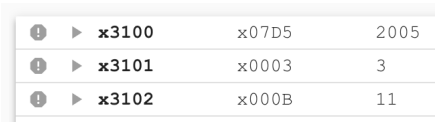

Figure 5: Test with 2005

All results are correct.