

## ECE 190 - Homework 3 solutions

5.14

- (1) : 1001 100 001 111111 - NOT R4, R1
- (2) : 1001 101 010 111111 - NOT R5, R2
- (3) : 0101 110 100 000 101 - AND R6, R4, R5
- (4) : 1001 011 110 111111 - NOT R3, R6

This problem uses the DeMorgan's law to compute OR operation

5.15

$$R1 = x3101 + x20 = x3121$$

$$R2 = \text{mem}[x3102 + x20] = \text{mem}[x3122] = x4566$$

$$R3 = \text{mem}[\text{mem}[x3103 + x20]] = \text{mem}[\text{mem}[x3123]] = \text{mem}[x4567] = xABCD$$

$$R4 = \text{mem}[x4566 + x1] = \text{mem}[x4567] = xABCD$$

5.18

$$\text{LD} = 2$$

$$\text{LD} = 2$$

$$\text{LDI} = 3$$

5.19

$$2^6 = 64$$

Therefore the new range of addresses is +63 to -64

5.22

LEA R6, 00011111	R3 = x3011 + x3F = x3050
LDR R4, R3, 000000	R4 = mem[R3 + 0] = x70A4
LDR R6, R4, 000000	R6 = mem[R4 + 0] = x123B

The single instruction to replace this sequence is

LDI R6, 00011111  
1010 1100 0011 1111

5.24

DR = mem[x4011 + b0111111] = x4030	-> Largest address if sign-extended
DR = mem[x4011 + b1111111] = x4050	-> Largest address if zero-extended
DR = mem[x4011 + b0000000] = x4011	-> Smallest address if zero-extended

5.27

$$R2 = x3102 \quad \text{-> at the end of the 2nd instruction}$$

$$R2 = 0 \quad \text{-> at the end of 4th instruction}$$

$$R2 = 5 \quad \text{-> at the end of 5th instruction}$$

5.32

x3050 BRp x2

$PC = x3051 + x2 = x3053$

..

x3053 AND R0, R0, 00000

$R0 = R0 \text{ AND } 00000 = 0$

$N = 0, Z = 1, P = 0$

x3054 ADD R0, R0, 11111

$R0 = 0 + 1111111111111111$

$R0 = 0 - 1 = -1$

$N = 1, Z = 0, P = 0$