**.ORIG x3000**

**cint LD R3,b15 ; R3 = b15**

**LD R1,a ; R1 = a**

**LD R2,b ; R2 = b**

**NOT R4, R1 ; R4 = NOT(R1) = NOT(a)**

**NOT R5, R2 ; R5 = NOT(R2) = NOT(b)**

**AND R4, R4, R2 ; R4 = R4 AND R2 = NOT(a) AND b**

**AND R5, R5, R1 ; R5 = R5 AND R1 = NOT(b) AND a**

**ADD R4, R4, R5 ; R4 = R4 + R5 = [NOT(a) AND b] + [NOT(b) AND a]**

**AND R4, R4, R3 ; R4 = R4 AND R3 = ([NOT(a) AND b] + [NOT(b) AND a]) AND x8000**

**BRzp cmp ; IF R4 >= 0 GO TO cmp**

**retA ST R1,r ; r = R1**

**BR leave ; GO TO leave**

**cmp NOT R2,R2 ; R2 = NOT(R2) = NOT(b)**

**ADD R2,R2,#1 ; R2 = R2 + 1 = NOT(b) + 1 = -b**

**ADD R2,R1,R2 ; R2 = R1 + R2 = a + NOT(b) + 1 = a - b**

**ST R2,r ; r = R2**

**leave HALT**

**a .FILL #9**

**b .FILL #4**

**b15 .FILL x8000**

**r .FILL x3100**

**.END**

QUESTION 3:

**.ORIG x3000**

**LD R1,X ; R1 = X**

**LD R2,Y ; R2 = Y**

**NOT R1,R1 ; R1 = NOT(X)**

**AND R3,R1,R2 ; R3 = NOT(X) AND Y**

**NOT R1,R1 ; R1 = X**

**NOT R2,R2 ; R2 = NOT(Y)**

**AND R4,R1,R2 ; R4 = X AND NOT(Y)**

**NOT R2,R2 ; R2 = Y**

**NOT R3,R3 ; R3 = NOT[NOT(X) AND Y] = X OR NOT(Y)**

**NOT R4,R4 ; R4 = NOT[X AND NOT(Y)] = NOT(X) OR Y**

**AND R3,R3,R4 ; R3 = [X OR NOT(Y)] AND [NOT(X) OR Y]**

**NOT R3,R3 ; R3 = NOT([X OR NOT(Y)] AND [NOT(X) OR Y])**

**; R3 = [NOT(X) AND Y] OR [X AND NOT(Y)] = X XOR Y**

**; R3 = X ^ Y**

**; R3 = R1 XOR R2 = R1 ^ R2**

**AND R4,R4,#0 ; clear R4**

**HALT**

**X .FILL x25 ; X = 37 (DEC)**

**Y .FILL x3A ; Y = 58 (DEC)**

**; X XOR Y :**

**; 0010 0101**

**; XOR 0011 1010**

**; -----------------**

**; 0001 1111 = 31 (DEC)**

**.END**