Homework 5 of Chapter 5,6
Ch5:

10

A is BRnzp #-171 B is JSR R7, #-171.
A and B both change PC from its previous value to PC-170.
However, B puts the information in R7 and A doesn't.

15

R1 = x3121
R2 = x4566
R3 = xABCD
R4 = xABCD

41

(a) Y is the P code of the NZP.
(b) Yes, there is a problem. Gate A should not exist. The logic has the
    R-S latch part so it can store information, but gate A, which means
    BR (0000), does not have the function of storing information.

Ch6:

3

·x3000	1010000000001110	xA00E	LDI	R0, x300F
x3001	1010001000001110	xA20E	LDI	R1, x3010
x3002	0101010010100000	x54A0	AND	R2, R2, #0
x3003	0001010010100001	x14A1	ADD	R2, R2, #1
x3004	0001000000100001	x1021	ADD	R0, R0, #1
x3005	0001000000111111	x103F	ADD	R0, R0, #-1
x3006	0000010000000010	x0402	BRZ	x3009
x3007	0001010010000010	x1482	ADD	R2, R2, R2
x3008	0000111111111100	x0FFC	BRNZP	x3005
x3009	1001001001111111	x927F	NOT	R1, R1
x300A	1001010010111111	x94BF	NOT	R2, R2
x300B	0101001001000010	x5242	AND	R1, R1, R2
x300C	1001001001111111	x927F	NOT	R1, R1
x300D	1011001000000010	xB202	STI	R1, x3010
ʼx300E	1111000000100101	xF025	TRAP	HALT
x300F	0100000000000000	x4000	JSRR	R0
x3010	0100000000000001	x4001	JSRR	R0

Solution: double R2 = 0000 0000 0000 0001 for n times (n is the number
stored in x4000), then R2 means which one has just turned busy. And
use De Morgan's law to implement OR (A OR B = NOT (NOT A AND NOT
B)).

9

```
x3000   0010000000000101   x2005           LD     R0, Z
x3001   0010001000000101   x2205           LD     R1, N
x3002   1111000000100001   xF021   LOOP    TRAP   OUT
x3003   0001001001111111   x127F           ADD    R1, R1, #-1
x3004   0000001111111101   x03FD           BRP    LOOP
x3005   1111000000100101   xF025           TRAP   HALT
x3006   0000000001011010   x005A   Z       NOP
x3007   0000000001100100   x0064   N       NOP
```

(result)

```
ZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZ
ZZZZZZZZZZZZZZZZZZZZ
```

10

```
x3000   0101001010100001   x52A1           AND    R1, R2, #1
x3001   0000010000000001   x0401           BRZ    NO
x3002   0000001000000011   x0203           BRP    YES
x3003   0010000000000110   x2006   NO      LD     R0, N
x3004   1111000000100001   xF021           TRAP   OUT
x3005   1111000000100101   xF025           TRAP   HALT
x3006   0010000000000010   x2002   YES     LD     R0, Y
x3007   1111000000100001   xF021           TRAP   OUT
x3008   1111000000100101   xF025           TRAP   HALT
x3009   0000000001011001   x0059   Y       NOP
x300A   0000000001001110   x004E   N       NOP
```

Solution: R1<- R2 AND 0000 0000 0000 0001, so if the R2 is odd, the last

number of R2 is 1, then R1 is #1. If R2 is even then R1 is #0.