Homework #4

Andy P.

Ch. 6 4, 7, 11, 15, 20, 21, 23, 29, 34, 45

4. ① $\Sigma_1 = (A \oplus B) \oplus C$

$= (1 \oplus 1) \oplus C$

$= 0 \oplus 0$

$= 0$

$C_{out} = AB + (A \oplus B) C_{in}$

$= (1)(1) + (1 \oplus 1)(0)$

$= 1 + 0$

$= 1$

② $A = 1 \quad B = 0 \quad C_{in} = 1$

$\Sigma_2 = (A \oplus B) \oplus C_{in}$

$= (1 \oplus 0) \oplus 1$

$= 1 \oplus 1$

$= 0$

$C_{out} = AB + (A \oplus B) C_{in}$

$= 0 + (1)(1)$

$= 1$

③ $A = 1 \quad B = 1 \quad C_{in} = 1$

$\Sigma_3 = (A \oplus B) \oplus C_{in}$

$= (1 \oplus 1) \oplus 1$

$= 0 \oplus 1$

$= 1$

$C_{out} = AB + (A \oplus B) C_{in}$

$= 1 + 0$

$= 1$

$\Sigma_4 \Sigma_3 \Sigma_2 \Sigma_1 = \boxed{1100}$

④ $\Sigma_4 = AB + (A \oplus B) C_{in}$

$= 1 + (0)\,1$

$= 1$

7. A = 1001 B = 1100 ⇒ 0011

Add/Subt = 1

①

A=1 B=1 C_{in}=1

$\Sigma_1 = (A \oplus B) \oplus C_{in}$
$= (1 \oplus 1) \oplus 1$
$= 0 \oplus 1$
$= 1$

$C_{out} = AB + (A \oplus B) C_{in}$
$= 1 + (0)(1)$
$= 1$

② A=0 B=1 C_{in}=1

$\Sigma_2 = (A \oplus B) \oplus C_{in}$
$= (0 \oplus 1) \oplus 1$
$= 1 \oplus 1$
$= 0$

$C_{out} = AB + (A \oplus B) C_{in}$
$= 0 + (1)(1)$
$= 1$

③ A=0 B=0 C_{in}=1

$\Sigma_3 = (A \oplus B) \oplus C_{in}$
$= (0 \oplus 0) \oplus 1$
$= 0 \oplus 1$
$= 1$

$C_{out} = AB + (A \oplus B) C_{in}$
$= 0 + (0)(1)$
$= 0$

④ A=1 B=0 C_{in}=0

$\Sigma_4 = (A \oplus B) \oplus C_{in}$
$= (1 \oplus 0) \oplus 0$
$= 1 \oplus 0$
$= 1$

$C_{out} = AB + (A \oplus B) C_{in}$
$= 0 + (1)0$
$= 0 + 0$
$= 0$

$\Sigma_4 \Sigma_3 \Sigma_2 \Sigma_1 =$ **1101**

11. ① A to Σ and C_{out} = 40ns
② B to " " = 40ns
③ C_{in} to Σ = 35ns
④ " " to C_{out} = 25ns

$t_p = (①) + 6④ + ③$
$= 40 + 6(25) + 35$
$= \boxed{225\text{ns}}$

15.

a)

A>B	1
A=B	0
A<B	0

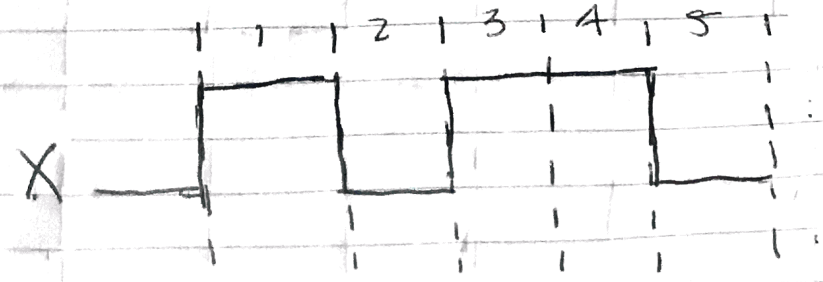
b)

A>B	0
A=B	0
A<B	1

c)

A>B	0
A=B	1
A<B	1

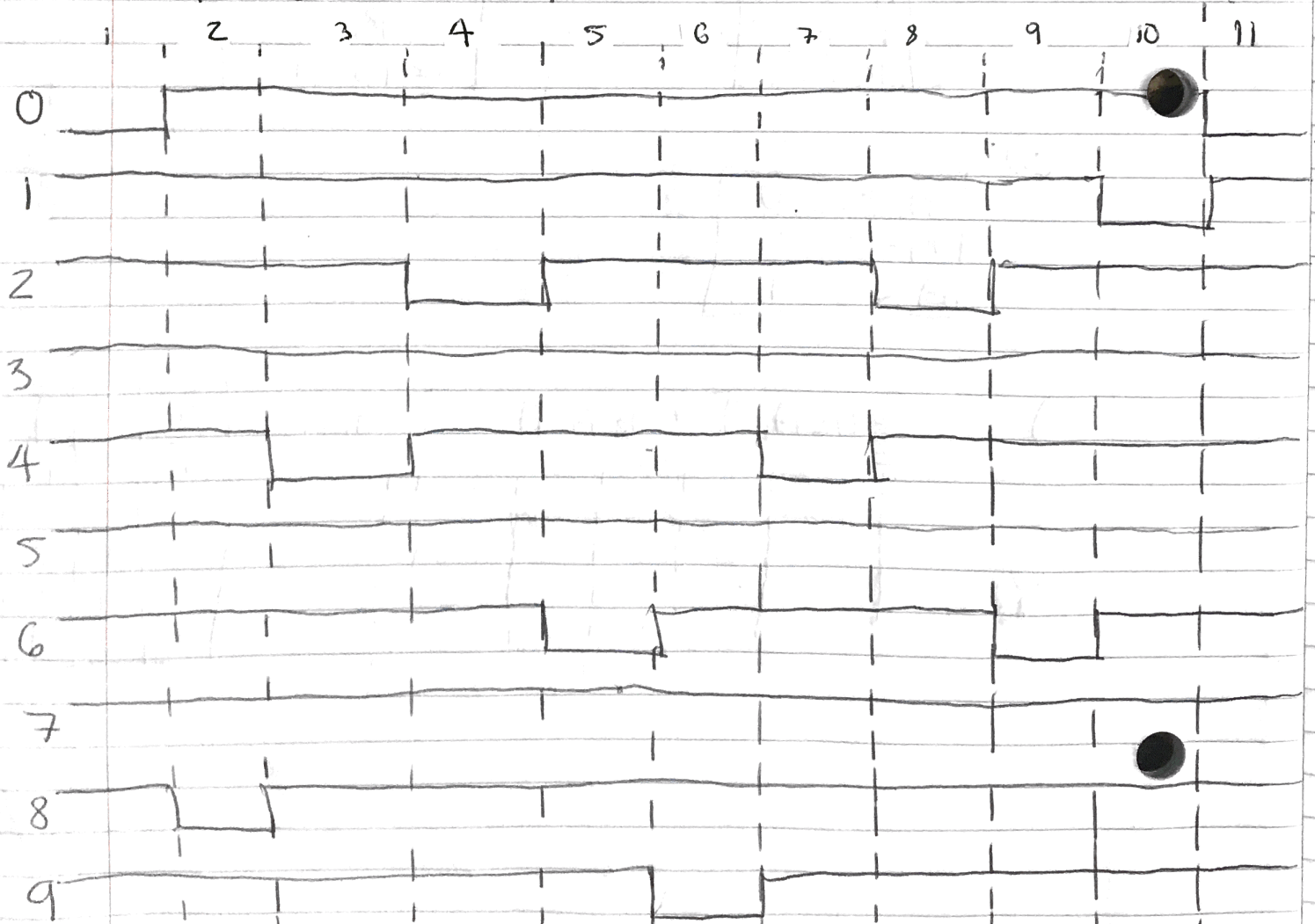
20) $Y = A_2 A_1 \overline{A_0} + A_2 \overline{A_1} A_0 + \overline{A_2} A_1 \overline{A_0}$



A_2	A_1	A_0	X
1	0	1	1
1	0	0	0
1	1	0	1
0	1	0	1
0	0	1	0

21.

	A_3	A_2	A_1	A_0	O/U in active low
1	0	0	0	0	0
2	1	0	0	0	8
3	0	1	0	0	4
4	0	0	1	0	2
5	0	1	1	0	6
6	1	0	0	1	9
7	0	1	0	0	4
8	0	0	1	0	2
9	0	1	1	0	6
10	0	0	0	1	1
11	0	0	0	0	0



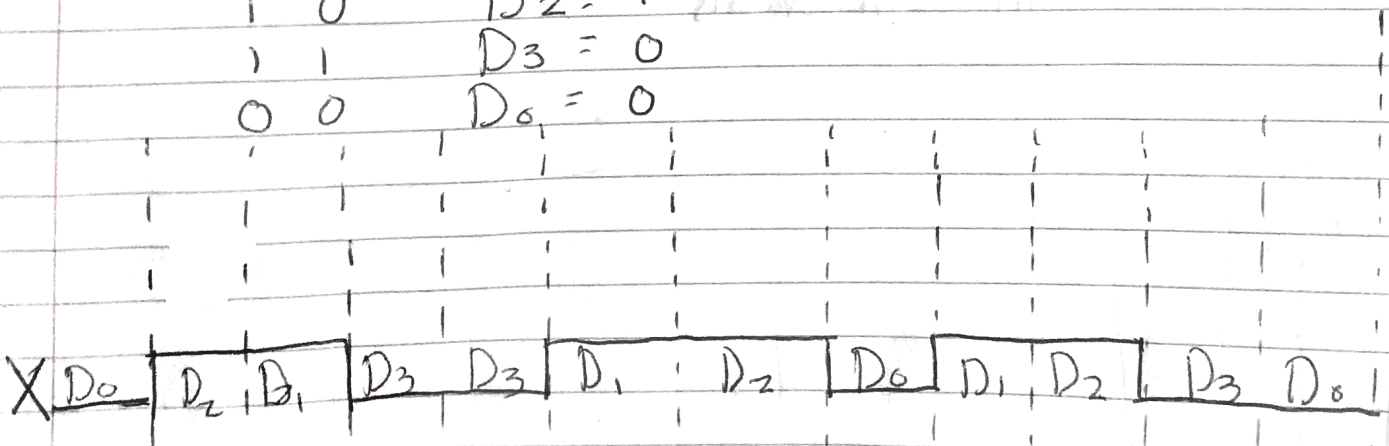
23. 9 = High = A_0 & A_3 are 1
3 = High = A_1 is 1

Output Code: 1011

This is not a valid BCD code since 1011 = 12 and its not 0-9.

29.

S_1	S_0	D_x
0	0	$D_0 = 0$
1	0	$D_2 = 1$
0	1	$D_1 = 1$
1	1	$D_3 = 0$
1	1	$D_3 = 0$
0	1	$D_1 = 1$
1	0	$D_2 = 1$
0	0	$D_0 = 0$
0	1	$D_1 = 1$
1	0	$D_2 = 1$
1	1	$D_3 = 0$
0	0	$D_0 = 0$



34.

	A	B	Cin	Σ	Cout
1	0	0	0	0	0
2	0	0	1	1	0
3	0	1	0	1	0
4	0	1	1	0	1
5	1	0	0	1	0
6	1	0	1	0	1
7	1	1	0	0	1
8	1	1	1	1	1

on 1 A=0, B=0, Cin=0 yet $\Sigma = 1$!
on 2 A=0, B=0, Cin=1 yet Cout = 0

It is **not operating properly.**

Cin is at fault here since it is oscilating yet it is always considering logic 1 to all intervals.

45. $\bar{A}\bar{B}C_{in} + \bar{A}B\bar{C_{in}} + A\bar{B}\bar{C_{in}} + ABC_{in} = \Sigma$

$\bar{A}BC_{in} + A\bar{B}C_{in} + AB\bar{C_{in}} + ABC_{in} = C_{out}$

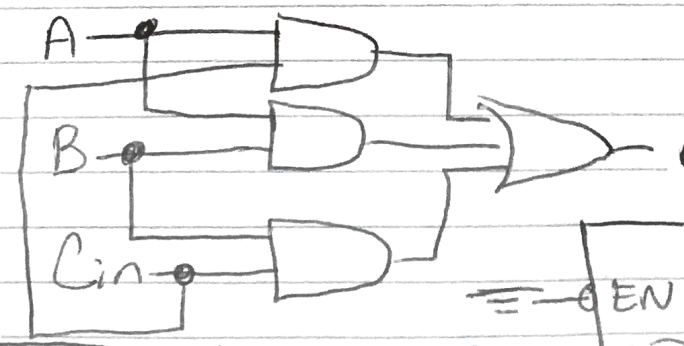
A \ BC	00	01	11	10
0	0	1	0	1
1	1	0	1	0

$= \Sigma$

A \ BC	00	01	11	10
0	0	0	1	0
1	0	1	1	1

$= C_{out}$

$C_{out} = AC_{in} + BC_{in} + AB$



010 = 2
100 = 4
001 = 1
111 = 7

101 = 5
111 = 7
011 = 3
110 = 6