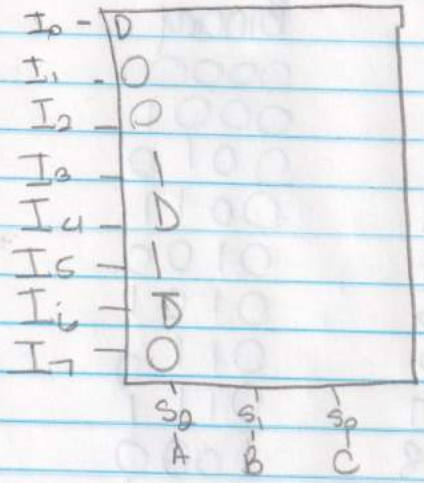
Steven Tang

Homework 4

1.



	A	B	C	D	F
I_0	0	0	0	0	0
	0	0	0	1	1
I_1	0	0	1	0	0
	0	0	1	1	0
I_2	0	1	0	0	0
	0	1	0	1	0
I_3	0	1	1	0	1
	0	1	1	1	1
I_4	1	0	0	0	0
	1	0	0	1	1
I_5	1	0	1	0	D
	1	0	1	1	D
I_6	1	1	0	0	1
	1	1	0	1	0
I_7	1	1	1	0	0
	1	1	1	1	0

= B) $F(A,B,C,D) = \Sigma(1,6,7,9,10,11,12)$

2. C_i = Carry out
C_{i-1} = Carry in
$P_i = X \oplus Y$

A) $\overline{(\overline{G_i P_i} + \overline{G_i C_{i-1}})}$

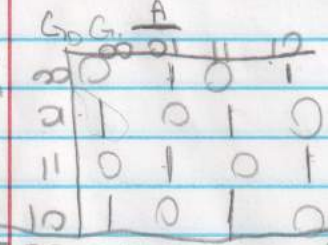
$= (\overline{\overline{G_i P_i}})(\overline{\overline{G_i C_{i-1}}})$

$= (G_i + \overline{P_i})(G_i + C_{i-1})$

3.

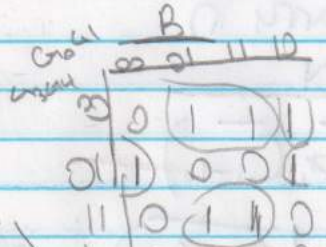
	Gray Code	Binary
0	0000	0000
1	0001	0001
2	0011	0010
3	0010	0011
4	0110	0100
5	0111	0101
6	0101	0110
7	0100	0111
8	1100	1000
9	1101	1001
10	1111	1010
11	1110	1011
12	1010	1100
13	1011	1101
14	1001	1110
15	1000	1111
	$G_3G_2G_1G_0$	DCBA

A



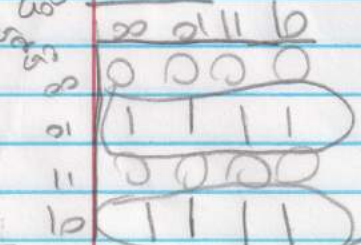
$= \bar{G}_0\bar{G}_1\bar{G}_2G_3 + G_0\bar{G}_1\bar{G}_2\bar{G}_3 + \bar{G}_0G_1\bar{G}_2G_3 + G_0G_1\bar{G}_2G_3 + \bar{G}_0\bar{G}_1G_2\bar{G}_3 + G_0\bar{G}_1G_2\bar{G}_3 + \bar{G}_0G_1G_2\bar{G}_3 + G_0G_1G_2\bar{G}_3$

B



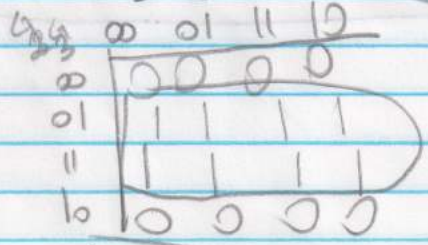
$= G_1\bar{G}_2\bar{G}_3 + \bar{G}_0G_1\bar{G}_2 + \bar{G}_0G_1\bar{G}_3 + G_1G_2G_3$

C



$= \bar{G}_2G_3 + G_2\bar{G}_3 = G_2 \oplus G_3$

D



$= G_3$

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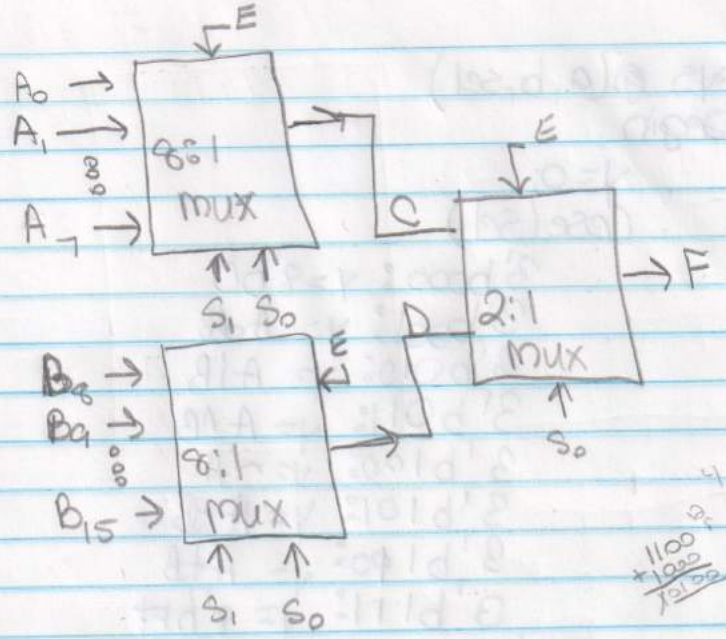
4.



5. A) m=0 means adder

$C_0=0\ C_1=0\ C_2=0\ C_3=1\ C_4=0$

$S_0=1\ S_1=0\ S_2=1\ S_3=1\ V=1$

B) $C_0=0\ C_1=0\ C_2=0\ C_3=0\ C_4=1$

$S_0=1\ S_1=0\ S_2=0\ S_3=0\ V=1$

C) $C_0=0\ C_1=0\ C_2=0\ C_3=0\ C_4=1$

$S_0=0\ S_1=0\ S_2=1\ S_3=0\ V=1$

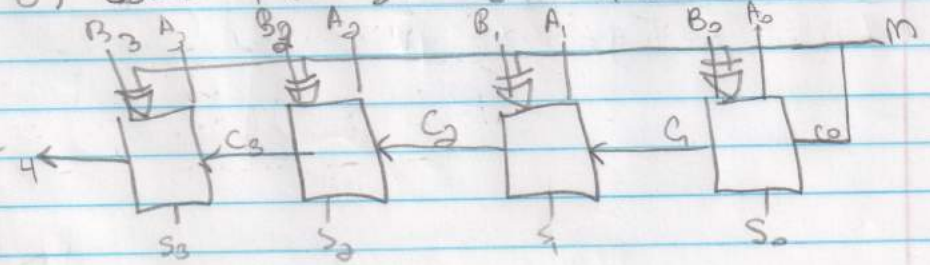
D) $C_0=0\ C_1=0\ C_2=1\ C_3=1\ C_4=0$

$S_0=0\ S_1=0\ S_2=1\ S_3=1\ V=1$

E) $C_0=0\ C_1=0\ C_2=0\ C_3=0\ C_4=0$

	M	A	B
A	0	0111	0110
B	0	1000	1001
C	1	1100	1000
D	1	0101	1010
E	1	0000	0001

b)



7.
```
always @(a, b, sel)
    begin
        y=0;
        case(sel)
            3'b000: y=8'b0
            3'b001: y= A+B
            3'b010: y= A|B
            3'b011: y= A^B
            3'b100: y= ~A
            3'b101: y= A-B
            3'b110: y= A+B
            3'b111: y= 8'hFF
        endcase
    end
```