

Raymond You

EECE 2160 – Kimani 8 am

Homework 4

1a.

a	A	B	C	D	Y
0	0	0	0	0	1
0	0	0	0	1	0
0	0	0	1	0	1
0	0	0	1	1	0
0	0	1	0	0	0
0	0	1	0	1	1
0	0	1	1	0	0
0	0	1	1	1	1
1	0	0	0	0	1
1	0	0	0	1	0
1	0	0	1	0	1
1	0	0	1	1	0
1	0	1	0	0	1
1	0	1	0	1	0
1	0	1	1	0	1
1	0	1	1	1	0
1	1	0	0	0	1
1	1	0	0	1	0
1	1	0	1	0	1
1	1	0	1	1	0
1	1	1	0	0	1
1	1	1	0	1	0
1	1	1	1	0	1
1	1	1	1	1	0

		CD			
		00	01	11	10
AB	00	1	0	0	1
	01	0	1	1	0
	11	1	0	0	0
	10	1	0	0	1

$$Y = B'D' + ABC' + A'BD$$

16.

A	B	C	Y
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1

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

$$Y = B$$

1c.

A	B	C	Y
0	0	0	1
0	0	1	1
<del>0</del>	1	0	0
<del>0</del>	1	1	0
<del>1</del>	0	0	0
<del>1</del>	0	1	1
1	1	0	1
1	1	1	0

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

$$Y = A'B' + B'C + ABC'$$



Id.	A	B	C	D	E	Y
	0	0	0	0	0	0
	0	0	0	0	0	0
	0	0	0	1	0	1
	0	0	0	1	0	1
	0	0	1	0	0	1
	0	0	1	0	1	0
	0	0	1	1	0	1
	0	0	1	1	1	1
	0	1	0	0	0	0
	0	1	0	0	1	0
	0	1	0	1	0	1
	0	1	1	0	0	1
	0	1	1	0	1	0
	0	1	1	1	0	1
	0	1	1	1	1	1
	1	0	0	0	0	0
	1	0	0	0	1	1
	1	0	0	1	0	1
	1	0	0	1	1	1
	1	0	1	0	0	0
	1	0	1	0	1	1
	1	0	1	1	0	0
	1	0	1	1	1	1
	1	1	0	0	0	0
	1	1	0	0	1	1
	1	1	0	1	0	1
	1	1	0	1	1	1
	1	1	1	0	0	0
	1	1	1	0	1	1
	1	1	1	1	0	0
	1	1	1	1	1	1

Y

BC DE

	00	01	11	10
00	0	0	1	0
01	1	0	1	1
11	1	0	1	1
10	0	0	1	0

$$A = 0$$

Y

BC DE

	00	01	11	10
00	0	1	1	1
01	0	1	1	0
11	0	1	1	0
10	0	1	1	1

$$A = 1$$

$$Y = DE + AE + A'CE' + AC'D$$

2a.

AB

CD

	00	01	11	10
00	1 <sup>0</sup>	1 <sup>4</sup>	1 <sup>2</sup>	1 <sup>8</sup>
01	0 <sup>1</sup>	0 <sup>5</sup>	0 <sup>13</sup>	1 <sup>9</sup>
11	0 <sup>3</sup>	0 <sup>7</sup>	0 <sup>15</sup>	1 <sup>11</sup>
10	1 <sup>2</sup>	1 <sup>6</sup>	1 <sup>4</sup>	1 <sup>10</sup>

$$F = (A + D')(\overline{A}\overline{B}' + D')$$



26.

A	B	C	D	H
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8
1	0	0	1	9
1	0	1	0	10
1	0	1	1	11
1	1	0	0	12
1	1	0	1	13
1	1	1	0	14
1	1	1	1	15

A B

C D

	00	01	11	10
00	1 <sup>0</sup>	1 <sup>4</sup>	0 <sup>12</sup>	1 <sup>8</sup>
01	0 <sup>1</sup>	1 <sup>5</sup>	1 <sup>13</sup>	0 <sup>9</sup>
11	0 <sup>3</sup>	1 <sup>7</sup>	1 <sup>15</sup>	0 <sup>11</sup>
10	1 <sup>2</sup>	0 <sup>6</sup>	0 <sup>14</sup>	1 <sup>10</sup>

Circle groups of zero here

~~$$F = (A + B + D')(D' + B')(A + B' + C + D)(B + D)$$~~

$$F = (B + D')(B' + C' + D)(A' + B' + D)$$



3a.

		y z			
x		00	01	11	10
	0	0 <sup>0</sup> 1	1 <sup>1</sup> 1	~ <sup>3</sup> ~	~ <sup>2</sup> ~
	1	1 <sup>4</sup> 1	1 <sup>5</sup> 1	~ <sup>7</sup> ~	1 <sup>6</sup> 1

x	y	z	
0	0	0	0
0	0	1	1
0	1	0	2
0	1	1	3
1	0	0	4
1	0	1	5
1	1	0	6
1	1	1	7

~~$$f = x + y + z$$~~

$$F(x, y, z) = 1$$

$$F(x, y, z) = \sum (0, 1, 2, 3, 4, 5, 6, 7)$$

36. AB

	00	01	11	10
00	0 <sup>0</sup>	1 <sup>4</sup>	1 <sup>12</sup>	0 <sup>1</sup>
01	0 <sup>1</sup>	0 <sup>5</sup>	0 <sup>13</sup>	0 <sup>9</sup>
11	0 <sup>3</sup>	1 <sup>7</sup>	0 <sup>15</sup>	0 <sup>11</sup>
10	1 <sup>2</sup>	0 <sup>6</sup>	0 <sup>14</sup>	1 <sup>10</sup>

~~$$F = B'D' + BC'D' + A'BCD$$~~

$$F(A, B, C, D) = C'D' + B'D' + A'B$$

$$F(A, B, C, D) = \Sigma(0, 2, 4, 6, 7, 8, 10, 12)$$

$$4. f = abc' + c'd + a'cd' + b'cd' = \sum (1, 2, 5, 6, 9, 10, 12, 13)$$

		ab			
		00	01	10	11
cd	00	0	0	1	0
	01	1	1	1	1
	11	0	0	0	0
	10	1	1	0	1

$$g = (a+b+c'+d')(b'+c'+d)(a'+c+d')$$

$$= \prod (3, 6, 9, 13, 14)$$

		ab			
		00	01	11	10
cd	00	1	1	1	1
	01	1	1	0	0
	11	0	1	1	1
	10	1	0	0	1

overlapping 1s

		ab			
		00	01	11	10
cd	00	0	0	1	0
	01	1	1	0	0
	11	0	0	0	0
	10	1	0	0	1

$$F = \cancel{a'c'd} + b'cd' + abc'd'$$



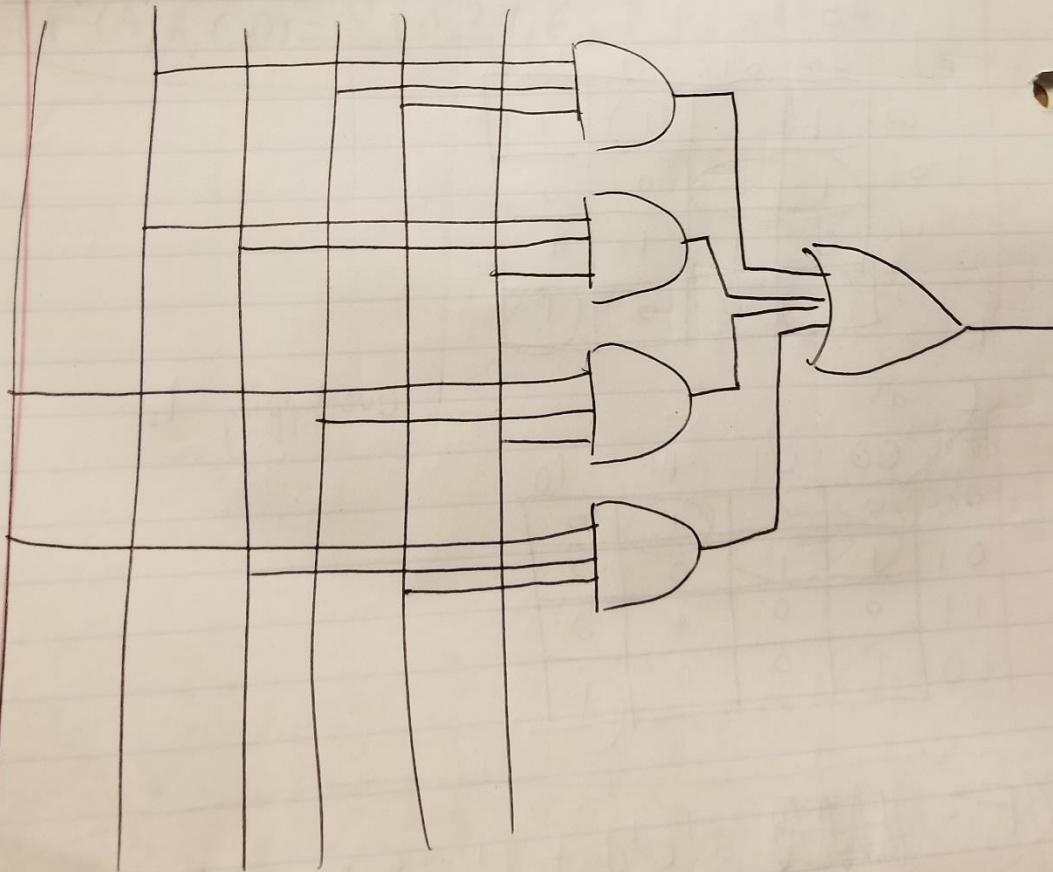
$$5. F(A, B, C) = \sum (1, 2, 4, 7)$$

BC

	00	01	11	10
A 0	0 <sup>0</sup>	1 <sup>1</sup>	0 <sup>3</sup>	1 <sup>2</sup>
1	1 <sup>4</sup>	0 <sup>5</sup>	1 <sup>7</sup>	0 <sup>6</sup>

$$F(A, B, C) = A'B'C + A'BC' + AB'C' + ABC$$

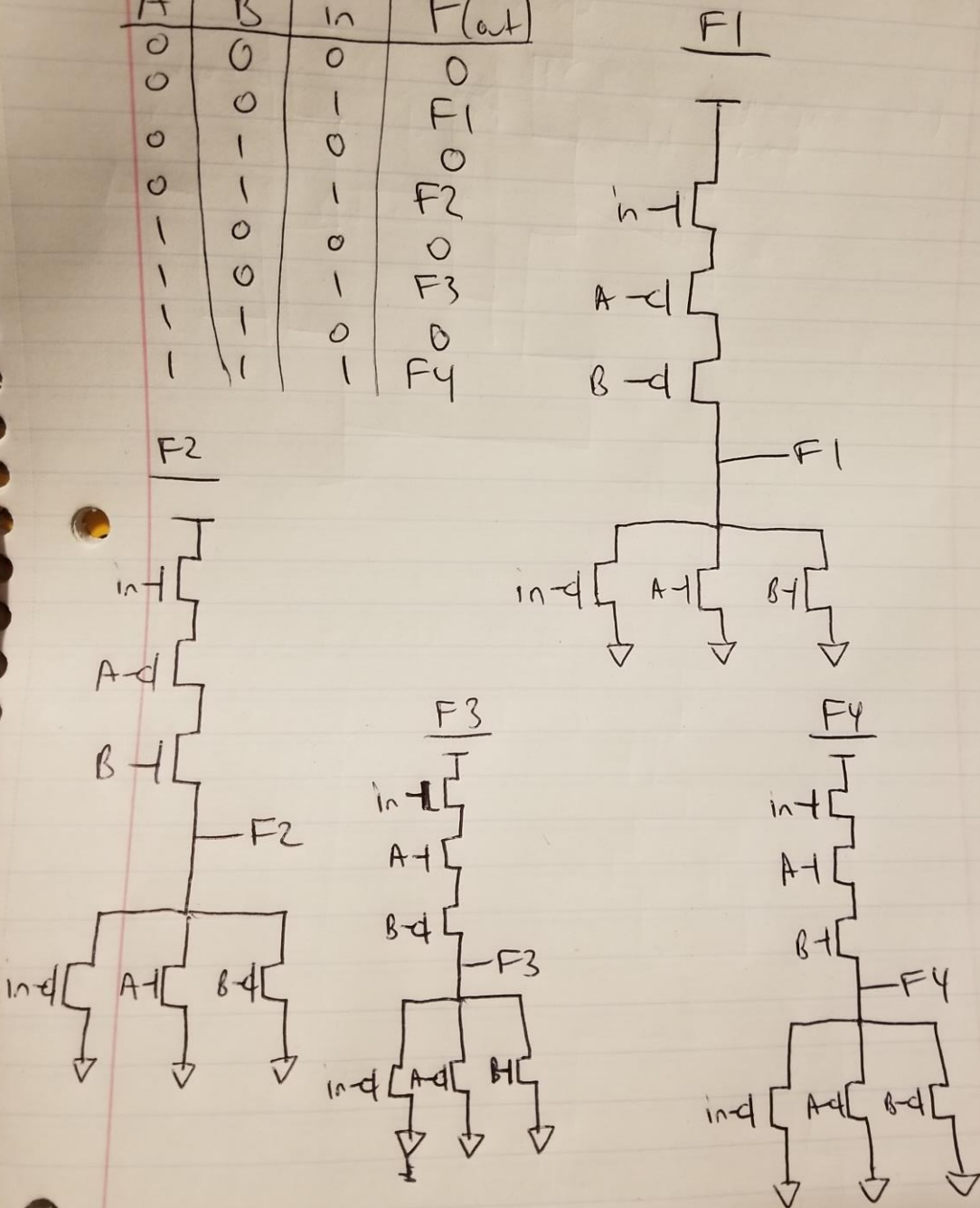
A    A'    B    B'    C    C'





6a. 2-to-4 decoder

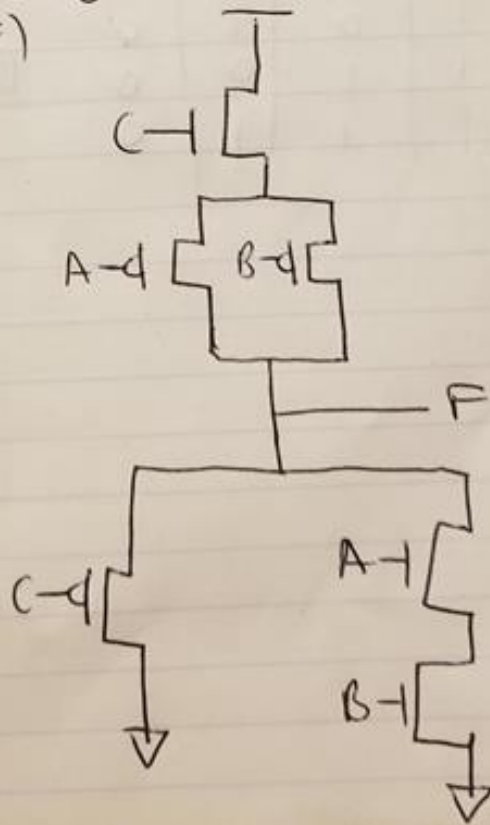
A	B	in	F(out)
0	0	0	0
0	0	1	F1
0	1	0	0
0	1	1	F2
1	0	0	0
1	0	1	F3
1	1	0	0
1	1	1	F4



6b.  $F(A, B, C) = (A' + B')C$

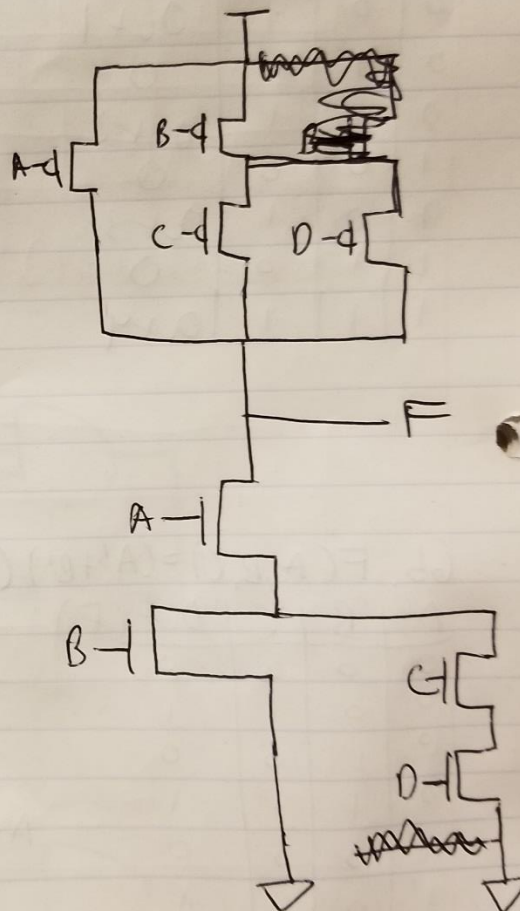
A	B	C	Out (F)
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	0

$F' = AB + C'$



6c.  $F = (A \cdot (B + CD))'$   
 $= A' + (B'C') + (B'D')$

A	B	C	D	out
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
0	1	0	0	1
0	1	0	1	1
0	1	1	0	1
0	1	1	1	1
1	0	0	0	1
1	0	0	1	0
1	0	1	0	0
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	0



Buffer gate

