2.1 Write a Boolean equation is sum-of-products canonical form for each of the truth tables

A.

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

$Y(A,B) = \Sigma(0,2,3)$

B.

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

$Y(A,B,C) = \Sigma(0,7)$

C. $Y(A,B,C) = \Sigma(0,2,4,5,7)$

D. $Y(A,B,C,D) = \Sigma(0,1,2,3,8,10,14)$

E. $Y(A,B,C,D) = \Sigma(0,3,5,6,9,10,12,15)$

2.2 (a-c) Write a boolean equation in sum-of-products canonical form

A. $Y(A,B) = \Sigma(1,2,3)$ B. $Y(A,B,C) = \Sigma(1,2,3,4,6)$ C. $Y(A,B,C) = \Sigma(1,6,7)$

2.3 (a-c) Write a boolean equation in product-of-sums canonical form

A. $Y(A,B) = \Pi(1)$ B. $Y(A,B,C) = \Sigma(1,2,3,4,5,6)$ C. $Y(A,B,C) = \Sigma(1,3,5)$

2.5 (a-c) Minimize each boolean equation from 2.1

A.

A \ B	0	1
0	1	0
1	1	1

$y = A + \overline{B}$

B.

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

$\overline{A}\overline{B}\overline{C} + ABC = Y$

C.

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

$Y = \overline{A}\overline{B} + A\overline{B} + AC$

2.6 (a-c) Minimize each boolean equation from 2.2

A.

A \ B	0	1
0	0	1
1	1	1

$A + B = Y$

B.

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

$\overline{A}C + \overline{A}B + A\overline{C}$

C.

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

$\overline{A} + AB$

2.28 Find a minimal Boolean equation for the function

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

$Y = AC + AB + A\overline{C}\,\overline{D}$

2.33 Picnic with critters

$E = S\overline{A} + H + AL$

2.34 Complete the design of the 7-segment decoder

A. S_c

$D_{1:0}$ \ $D_{3:2}$	00	01	11	00
00	1	1	1	0
01	1	1	1	1
11	X	X	X	X
10	1	1	X	X

$S_c = \overline{D_1}\,\overline{D_3} + \overline{D_1} D_2 + \overline{D_1}\,\overline{D_3} + D_1 \overline{D_3}$

$S_D = \overline{D_0}\,\overline{D_1}\,\overline{D_2} + \overline{D_1}\,\overline{D_3} + \overline{D_3}\,\overline{D_2} + \overline{D_0}\,\overline{D_3}$

$S_E = \overline{D_3}\,\overline{D_1}\,\overline{D_2} + \overline{D_0}\,\overline{D_3}$

$S_F = \overline{D_3}\,\overline{D_1}\,\overline{D_3} + \overline{D_1}\,\overline{D_3} + \overline{D_0}\,\overline{D_3} + \overline{D_1}\,\overline{D_2}$

S_g

$D_{1:0}$ \ $D_{3:2}$	00	01	11	10
00	0	0	1	1
01	1	1	0	1
11	x	x	x	x
10	1	1	x	x

$S_g = \overline{D_1}\,\overline{D_3} + \overline{D_0}\,\overline{D_3} + \overline{D_1}\,\overline{D_0} + \overline{D_1}\,\overline{D_2}$

represents with dont care's

B. $S_c = \overline{D_1} + D_2 + \overline{D_3} D_0$

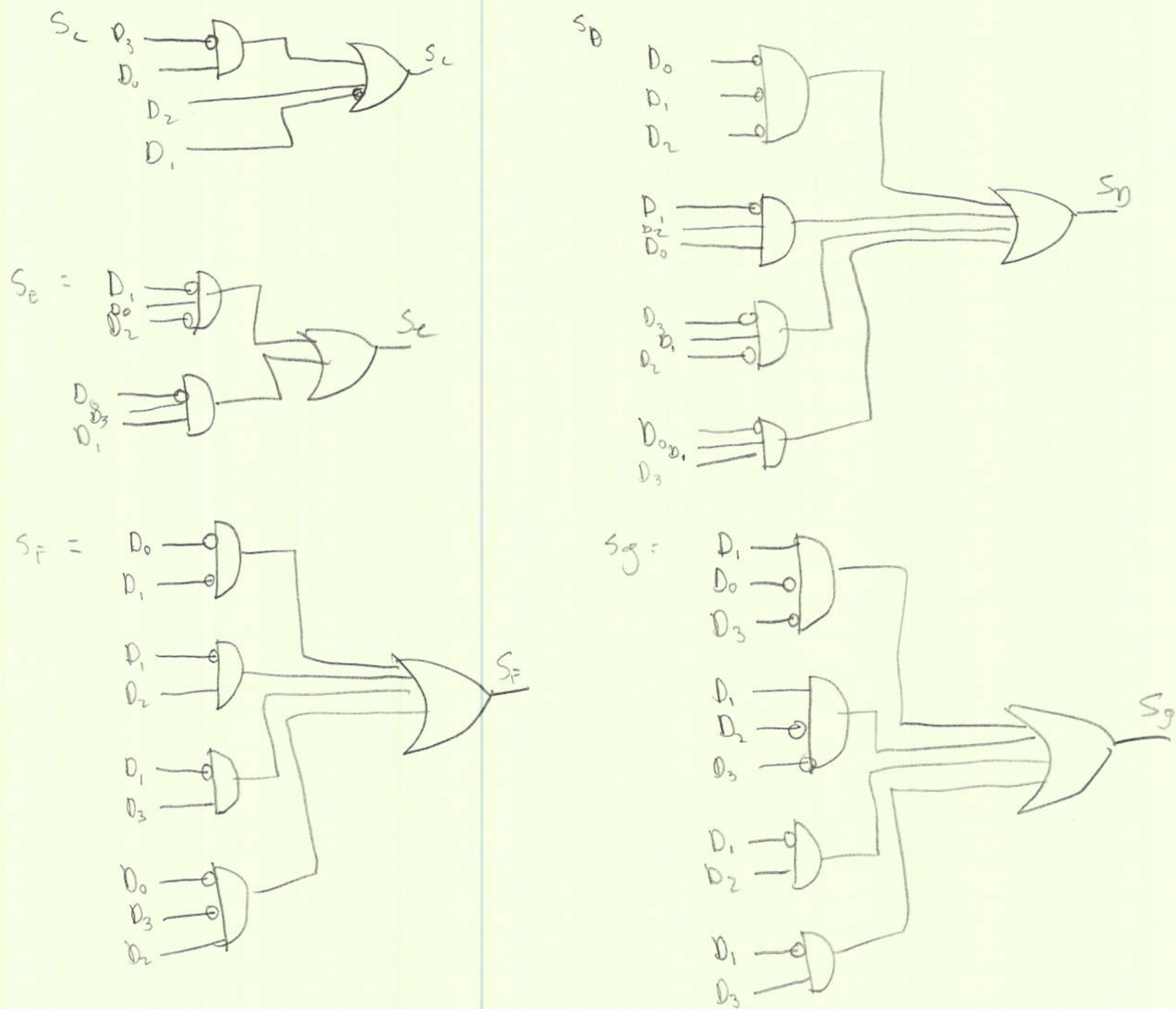
$S_D = \overline{D_0}\,\overline{D_1}\,\overline{D_2} + \overline{D_1} D_0 + \overline{D_3}\,\overline{D_2} + \overline{D_0} D_3$

$S_e = \overline{D_2}\,\overline{D_1} + \overline{D_0} D_1$

$S_F = \overline{D_0}\,\overline{D_1} + \overline{D_1} D_2 + \overline{D_1} D_3 + \overline{D_0}\,\overline{D_3} D_2$

$S_g = D_1\overline{D_0}\,\overline{D_3} + D_1\overline{D_2}\,\overline{D_3} + \overline{D_1} D_2 + \overline{D_1} D_3$

C. Sketch a simple gate level implementation for part b



2.35 A circuit has 4 input and 2 outputs $A_{3:0}$ represent 0-15
P should be true if # is prime D should be true if divisible by 3

A (A_3)	B (A_2)	C (A_1)	D (A_0)	P	D
0	0	0	0	0	0
0	0	0	1	0	0
0	0	1	0	1	0
0	0	1	1	1	1
0	1	0	0	0	0
0	1	0	1	1	0
0	1	1	0	0	1
0	1	1	1	1	0
1	0	0	0	0	0
1	0	0	1	0	1
1	0	1	0	0	0
1	0	1	1	1	0
1	1	0	0	0	1
1	1	0	1	1	0
1	1	1	0	0	0
1	1	1	1	0	1

P

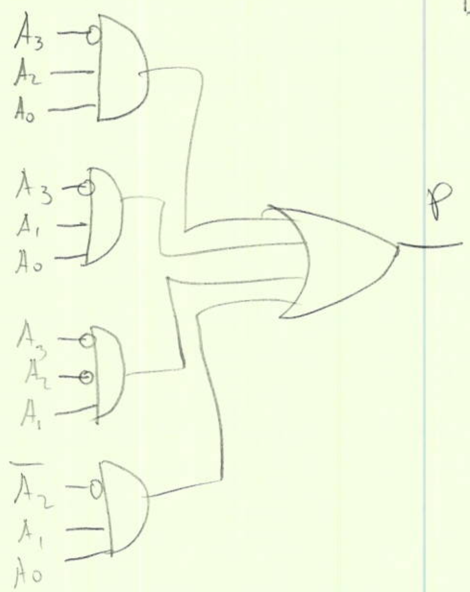
$A_{1:0}$ \ $A_{3:2}$	00	01	11	00
00	0	0	0	0
01	0	1	1	0
11	1	1	0	1
10	1	0	0	0

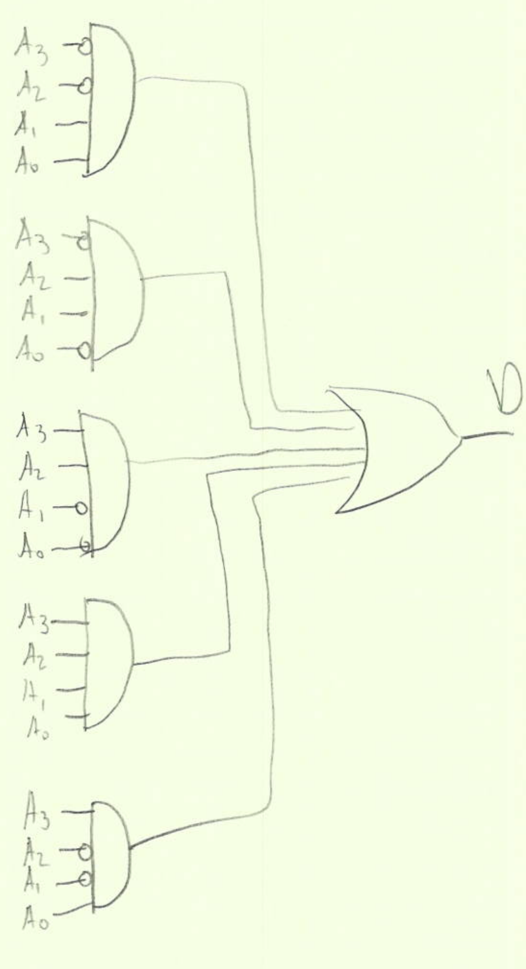
$P = \overline{A_3}A_2A_0 + \overline{A_3}A_1A_0 + \overline{A_3}\,\overline{A_2}A_1 + \overline{A_2}A_1A_0$

D

$A_{1:0}$ \ $A_{3:2}$	00	01	11	10
00	0	0	1	0
01	0	0	0	1
11	1	0	1	0
10	0	1	0	0

$D = \overline{A_3}\,\overline{A_2}A_1A_0 + \overline{A_3}A_2A_1\overline{A_0} + A_3A_2\overline{A_1}\,\overline{A_0} + A_3A_2A_1A_0 + A_3\overline{A_2}\,\overline{A_1}A_0$





2.43 Determine the propagation delay and contamination delay of the circuit in 2.83

$T_{pd} = 3T_{pd-NAND2} = 60$ $\qquad$ $T_{CD} = t_{cd-NAND2} = 15$

$\boxed{60ps}$ $\qquad$ $\boxed{15ps}$

2.44 Determine propagation and contamination delay 2.84

pd: $30 + 20 + 30 + 20 = \boxed{100ps}$

cd: $15 + 25 + 15 = \boxed{55ps}$

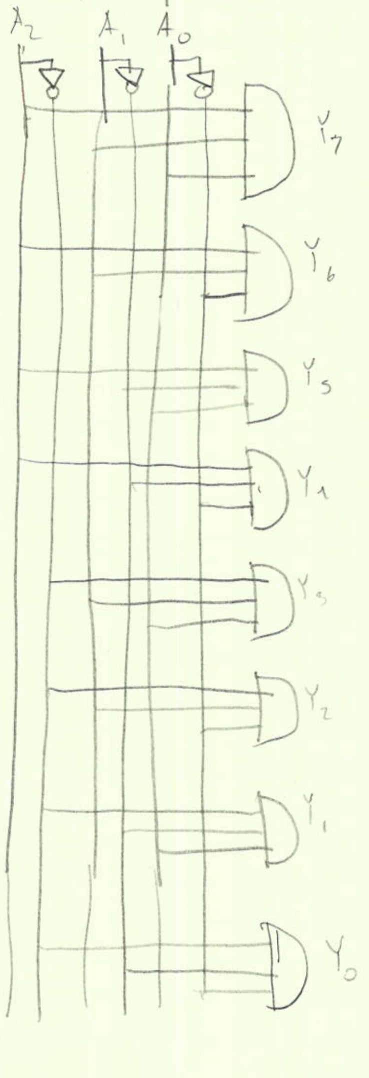
2.45 Sketch a schematic for a 3:8 decoder

A	B	C	Y_7	Y_6	Y_5	Y_4	Y_3	Y_2	Y_1	Y_0
0	0	0	0	0	0	0	0	0	0	1
0	0	1	0	0	0	0	0	0	1	0
0	1	0	0	0	0	0	0	1	0	0
0	1	1	0	0	0	0	1	0	0	0
1	0	0	0	0	0	1	0	0	0	0
1	0	1	0	0	1	0	0	0	0	0
1	1	0	0	1	0	0	0	0	0	0
1	1	1	1	0	0	0	0	0	0	0

$\bar{A}\bar{B}\bar{C} + \bar{A}\bar{B}C + \bar{A}B\bar{C} + \bar{A}BC + A\bar{B}\bar{C} + A\bar{B}C$
$+ AB\bar{C} + ABC$

$T_{pd} = T_{pd-NOT} + T_{pd-AND3}$
$15 + 40$
$\boxed{55ps}$

$T_{CD} = T_{cd-AND3}$
$\boxed{30ps}$



Interview 2.3

What is a tristate buffer? How and why is it used?

A tristate buffer has three possible output states, high, low, and floating. It has an input A, output Y, and enable E. when enable is true, the tristate buffer acts as a simple buffer, transferring the input value to the output. when enable is false, is allowed to float.

Tristate buffers are used on busses that connect multiple chips