

Tushar
SHRIVASTAVA

COEN-21: PreLab #4

Part 1 → Truth Table

inputs: A_1, A_0, B_1, B_0 $2^4 = 16$ rows

outputs: S_2, S_1, S_0

A_1	A_0	B_1	B_0	S_2	S_1	S_0
0	0	0	0	0	0	0
0	0	0	1	0	0	1
0	0	1	0	0	1	0
0	0	1	1	0	1	1
0	1	0	0	0	0	1
0	1	0	1	0	1	0
0	1	1	0	0	1	1
0	1	1	1	1	0	0
1	0	0	0	0	1	0
1	0	0	1	0	1	1
1	0	1	0	1	0	0
1	0	1	1	1	0	1
1	1	0	0	0	1	1
1	1	0	1	1	0	0
1	1	1	0	1	0	1
1	1	1	1	1	1	0

PART 2 - Create schematic Options for circuit outputs

a) using A_1 for select bit

b) Kmaps → S_2

i)

	B_1				
	A_0	00	01	11	10
$A_1 = 0$	0			1	
	1				
$A_1 = 1$	1	1	1	1	
	0		1	1	

expression
 $A_1 B_1 + A_0 B_1 B_0 + A_1 A_0 B_0$

i) continued

S_1 Kmap

$A_1 \backslash \begin{matrix} B_1 \\ A_0 \end{matrix}$		B_0			
		00	01	11	10
$A_1 = 0$	00			1	1
	01		1		1
$A_1 = 1$	11	1		1	
	10	1	1		

$$\text{expression: } A_1 B_1 B_0 + A_1 A_0 B_1 + \bar{A}_1 A_0 \bar{B}_1 B_0 + A_1 A_0 B_1 B_0 \\ + \bar{A}_1 A_0 B_1 + \bar{A}_1 B_1 \bar{B}_0$$

S_0 Kmap

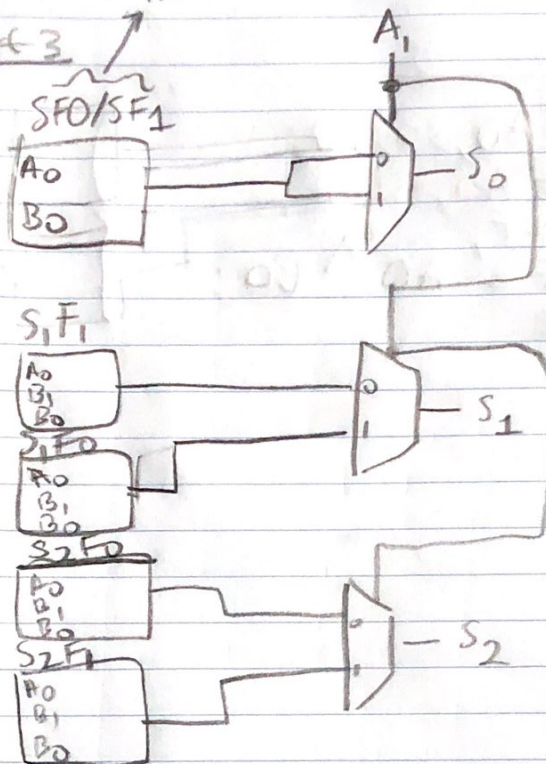
$A_1 \backslash \begin{matrix} B_1 \\ A_0 \end{matrix}$		B_0			
		00	01	11	10
$A_1 = 0$	00		1	1	
	01	1			1
$A_1 = 1$	11	1			1
	10		1	1	

$$S_0 = \bar{A}_0 B_0 + A_0 \bar{B}_0$$

From K-maps \rightarrow Shannon Expansion

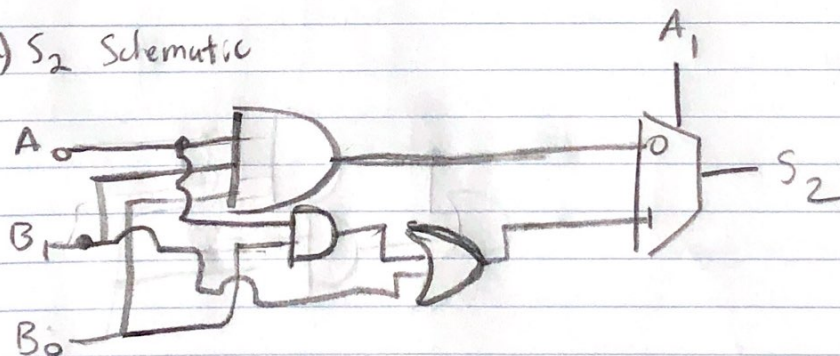
$$\begin{array}{l|l} S_0 F_0 = \bar{A}_0 B_0 + A_0 \bar{B}_0 = A_0 \oplus B_0 & S_2 F_0 = A_0 B_1 B_0 \\ S_0 F_1 = \bar{A}_0 B_0 + A_0 \bar{B}_0 = A_0 \oplus B_0 & S_2 F_1 = B_1 + A_0 B_0 \\ S_1 F_0 = \bar{A}_0 B_1 + A_0 \bar{B}_1 B_0 + B_1 B_0 & \\ S_1 F_1 = \bar{A}_0 B_1 + A_0 B_1 B_0 + \bar{B}_1 B_0 & \end{array}$$

Prelab Part 3 *Both are Same*



Prelab Part 4

a) S_2 Schematic



b) Verilog for S_1

```
module S1F1(A0, B0, B1, F);
input A0, B0, B1;
output F;
assign F = (A0 & B1 & B0) | (~B1 & ~B0) | (A1 & B1);
end module
```

```
module S1F0(A0, B0, B1, F);
input A0, B0, B1;
output F;
assign F = (~A0 & ~B1) | (B1 & ~B0) | (A0 & B1 & B0);
end module
```

c) verilog for S_0

```
module  $S_0(A_0, B_0, F);$   
  input  $= A_0, B_0;$   
  output  $= F;$   
  assign  $F = A_0 \wedge B_0;$   
end module
```

} b. $S_0 F_0 = S_0 F_1$
and
 \wedge means xor