

CSC 137 - HWK #3

1. Design a single cell - 1 bit Carry propagate (Ripple Carry Adder) full adder.

(a) Generate Truth Table

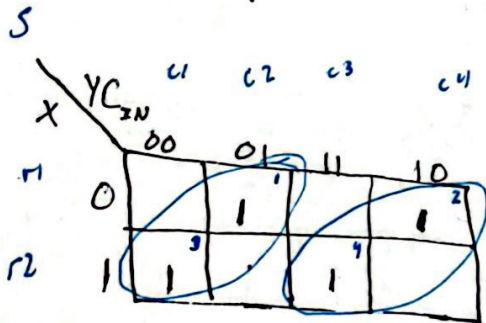
X	Y	C _{IN}	S	C _{OUT}
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
1	0	0	1	0
1	1	0	0	1
1	0	1	0	1
0	1	1	0	1
1	1	1	1	1

→ Logical Expr:

$$S = \bar{x} \bar{y} C_{IN} + \bar{x} y \bar{C}_{IN} + x \bar{y} \bar{C}_{IN} + x y C_{IN}$$

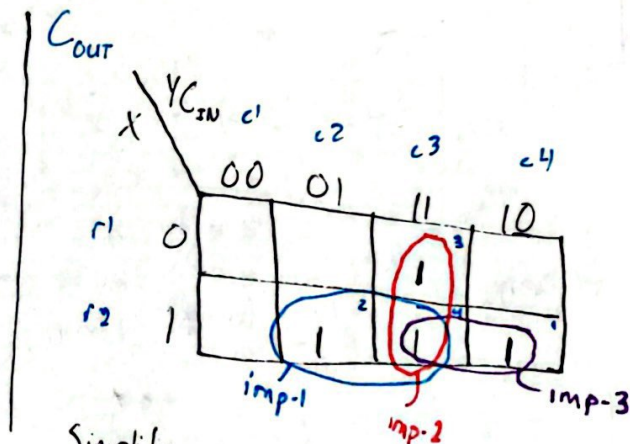
$$C_{OUT} = x y \bar{C}_{IN} + x \bar{y} \bar{C}_{IN} + \bar{x} y C_{IN} + x y C_{IN}$$

(b) K-Map



Simplify

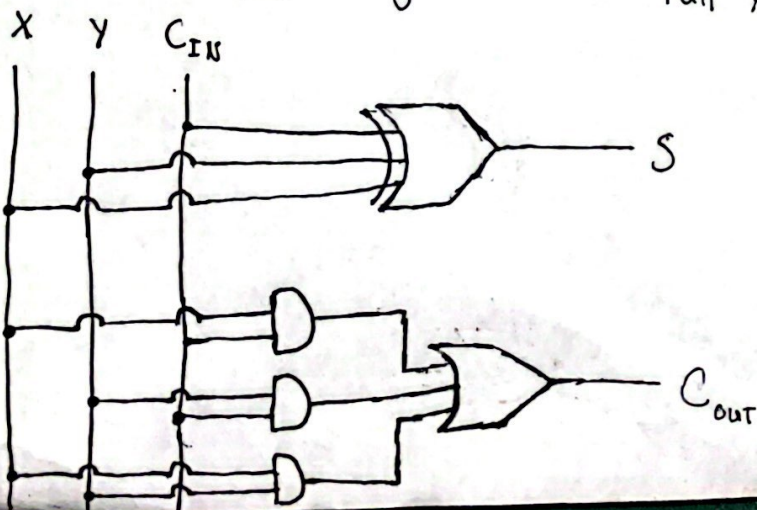
$$S = X \oplus Y \oplus C_{IN}$$



Simplify

$$C_{OUT} = X C_{IN} + Y C_{IN} + X Y$$

(c) Schematic Diagram For Full Adder:



2. Design a 1-bit, 2 to 1 multiplier (MUX). Outputs Y when $S=0$; X when $S=1$

(a) Truth Table

Selector	Input signals		Output
S	x	y	r
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1

Logical Expression

$$r = \bar{S}\bar{x}y + \bar{S}xy + Sx\bar{y} + Sxy$$

(b) K-Map

		xy			
		$c1$	$c2$	$c3$	$c4$
S		00	01	11	10
$r1$	0		1	1	
$r2$	1			1	1

Groupings: $imp-2$ (blue circle around cells (0,1) and (0,3)), $imp-1$ (purple circle around cells (1,3) and (1,4))

→ Simplify

$$r = \bar{S}y + Sx$$

(c) Create Schematic Diagram for Mux

