Solutions

Q1. Half Adder can add two bits. Truth table for a half adder is as follows:

x	y	S	C
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

$S = x \oplus y$

$C = xy$

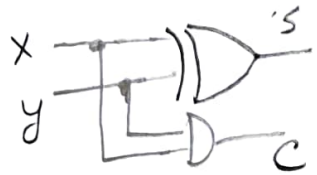


fig: Half adder ckt

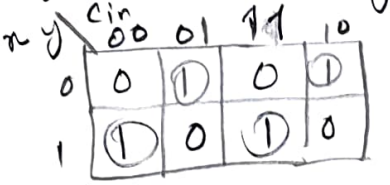
Q2.

x	y	C_{in}	C_{out}	S
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	0	1	1	0
1	1	0	1	0
1	1	1	1	1

Q3:

$C_{out} = xC_{in} + xy + yC_{in}$

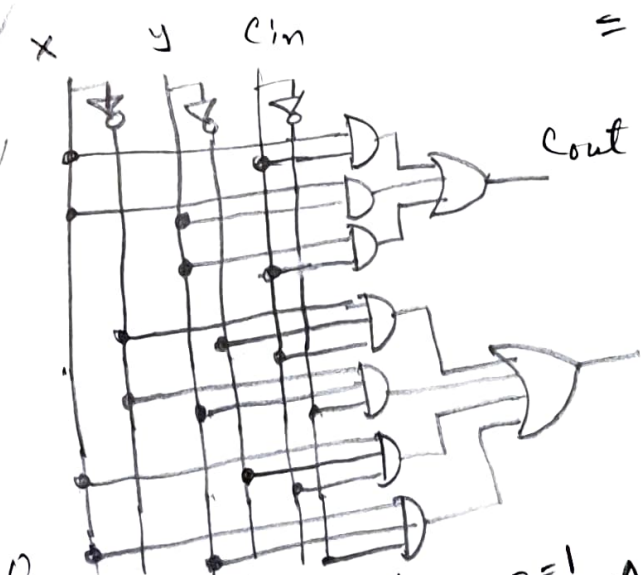
$= xy + C_{in}(x+y)$

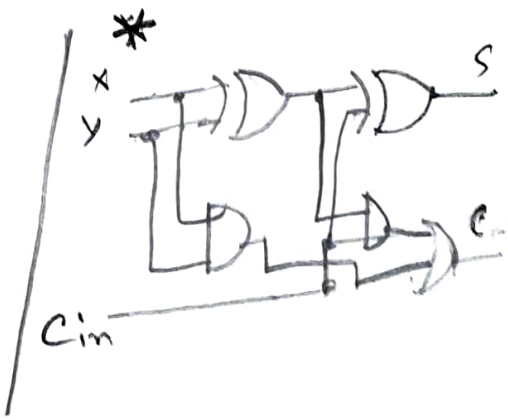


$S = \bar{x}\bar{y}C_{in} + \bar{x}y\bar{C}_{in} + x\bar{y}\bar{C}_{in} + xyC_{in}$

$= x \oplus y \oplus C_{in}$

Not preferable





Q4.