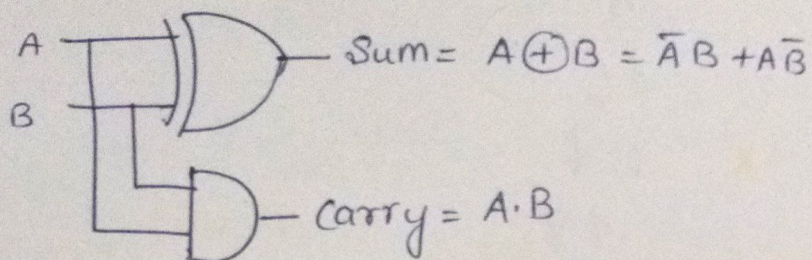


HA



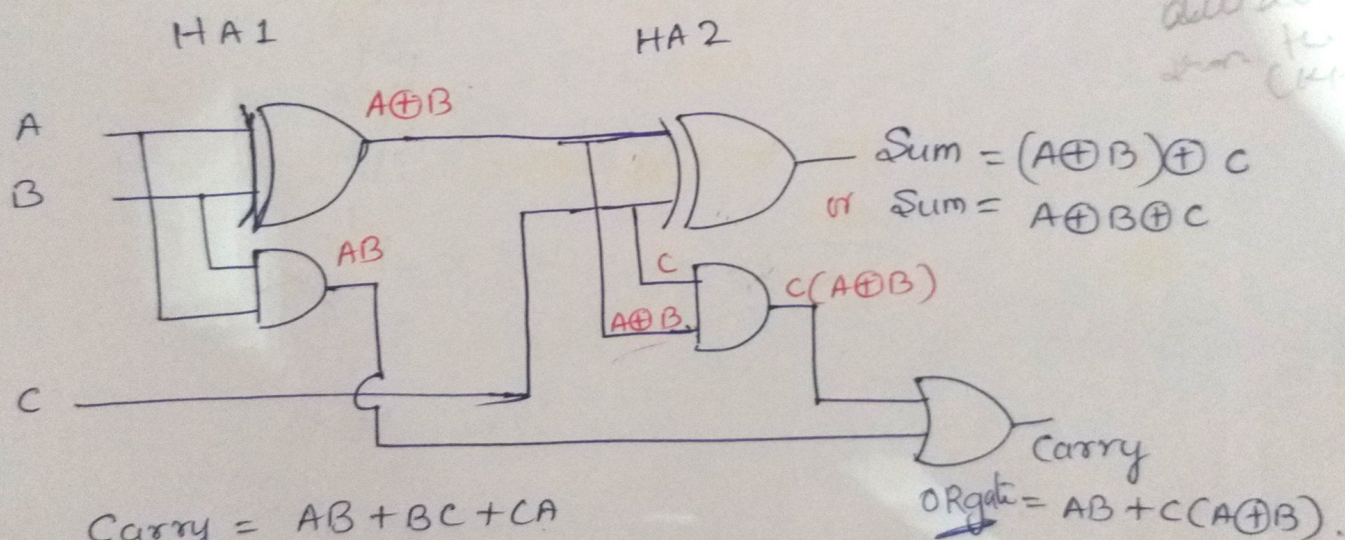
FA

$\text{Sum} = (A \oplus B) \oplus C$, $\text{Carry} = AB + BC + CA$

(A + A̅) → 1
should not change logic
changes expression that get all terms to be added
divide them for

$\text{Carry} = AB + BC + CA$
 $= AB + C(B + A)$

FA Using 2 HA's



$$\begin{aligned}
 \text{Carry} &= AB + BC + CA \\
 &= AB + BC(A + \bar{A}) + CA(B + \bar{B}) \\
 &= AB + A\bar{B}C + \bar{A}B\bar{C} + A\bar{B}C + A\bar{B}C \\
 &= \underline{AB + ABC} + \underline{\bar{A}B\bar{C} + A\bar{B}C} \\
 &= AB(1 + C) + C(\bar{A}B + A\bar{B}) \\
 \text{Carry} &= AB + C(A \oplus B)
 \end{aligned}$$

$\because A + \bar{A} = 1$
 $B + \bar{B} = 1$