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HW 5

1 $1 * 0 = 0$ $\quad 1 + 1 = 1$ $\quad 1 + 0 = 1$

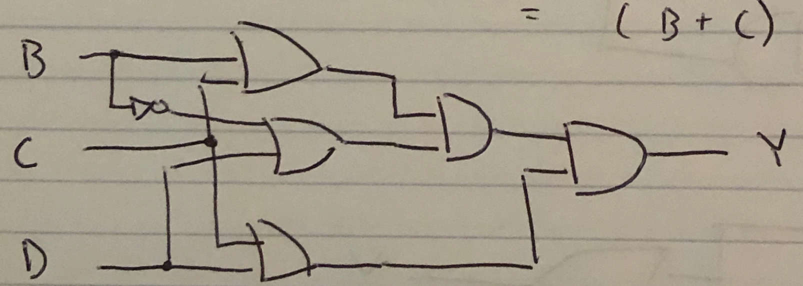
$E * E = E$ $\quad E + E = E$

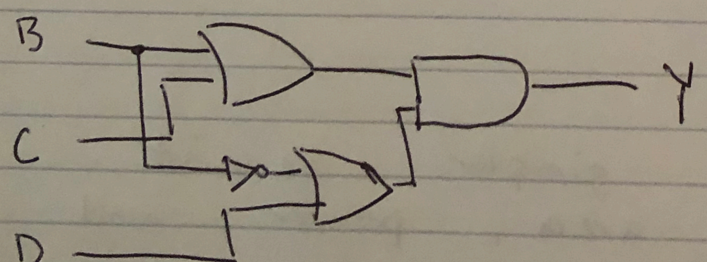
$E + 1 = 1$ $\quad E * \overline{E} = 0$ $\quad E + \overline{E} = 1$

$A + AB = A$ $\quad A + A\overline{B} = A$ $\quad A + \overline{A}B = (A + \overline{A})(A + B) = A + B$

2 $(B+C)(\overline{B}+D)(C+D) = (B+C)(\overline{B}+D)$

$$\begin{aligned}(B+C)(\overline{B}+D)(C+D) &= (B+C)(\overline{B}+D)(C+D+0)\\ &= (B+C)(\overline{B}+D)(C+D+B\overline{B})\\ &= (B+C)(\overline{B}+D)(B+C+D)(\overline{B}+C+D)\\ &= (B+C)(1+D)(\overline{B}+D)(1+C)\\ &= (B+C)(1)(\overline{B}+D)(1)\\ &= (B+C)(\overline{B}+D)\end{aligned}$$

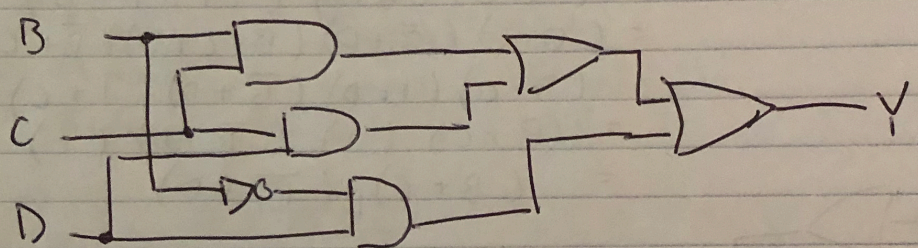


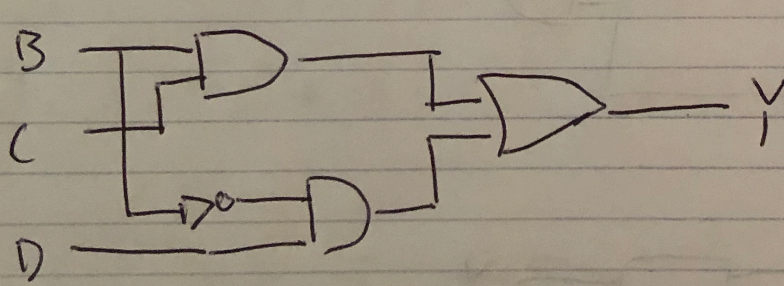


$(B+C)(\overline{B}+D)$ is simpler, meaning it requires less area, less power, and increased speed

$BC + \overline{B}D + CD = BC + \overline{B}D$

$$
\begin{aligned}
BC + \overline{B}D + CD &= BC + \overline{B}D + CD \cdot 1 \\
&= BC + \overline{B}D + CD \cdot (B + \overline{B}) \\
&= BC + \overline{B}D + CDB + CD\overline{B} \\
&= BC(1 + D) + \overline{B}D(1 + C) \\
&= BC \cdot 1 + \overline{B}D \cdot 1 \\
&= BC + \overline{B}D
\end{aligned}
$$





$BC + \overline{B}D$ is simpler so it requires less area, power, and increased speed