

WRITTEN

HOMEWORK #1

1.) Use Boolean Algebra to prove that

$$(\bar{A} * B * \bar{C}) + (\bar{A} * B * C) + (A * \bar{B} * C) + (A * B * \bar{C}) + (A * B * C) = (A+B) * (B+C)$$

$$B(\bar{A}\bar{C} + \bar{A}C + A\bar{C} + AC) + (A\bar{B}C) = (A+B)(B+C)$$

$$B + (A\bar{B}C) = (A+B)(B+C)$$

$$B + \bar{B}(AC) = B + AC$$

$$B + AC = B + AC$$

$$LHS = RHS \checkmark$$

\therefore equivalent

2.) Prove that $A \text{ XOR } B = A * \bar{B} + \bar{A} * B$

→ Truth Table

A	B	\bar{A}	\bar{B}	$A * \bar{B}$	$\bar{A} * B$	$A * \bar{B} + \bar{A} * B$	$A \oplus B$
0	0	1	1	0	0	0	0
0	1	1	0	0	1	1	1
1	0	0	1	1	0	1	1
1	1	0	0	0	0	0	0

↑ tautology \approx equivalent

XOR (\oplus) = cannot be same

i.e. $0 \oplus 0 = 0$ $1 \oplus 0 = 1$

$0 \oplus 1 = 1$ $1 \oplus 1 = 0$

$\therefore A \text{ XOR } B = A * \bar{B} + \bar{A} * B$

via truth table ✓

3.) Write function that represents following circuit. Do not simplify

$$(AB\bar{C}) + [(\bar{D}(AB\bar{C})) + ((AB\bar{C})' D)] * (\bar{A}D) + (\bar{D} + B) \text{ (simplified)}$$

$$f(x) = (AB\bar{C}) \oplus D * (\bar{A}D) + (\bar{D} + B) = F$$

$$AB\bar{C} \text{ XNOR } D * \text{NOT}(AD) + (\bar{D} + B) = F$$