CSC322 Assignment1
Ru Ou
V00835123

1.

2. Let A, B and C be three variables.

Assume $(A \barwedge B) \barwedge C = A \barwedge (B \barwedge C)$

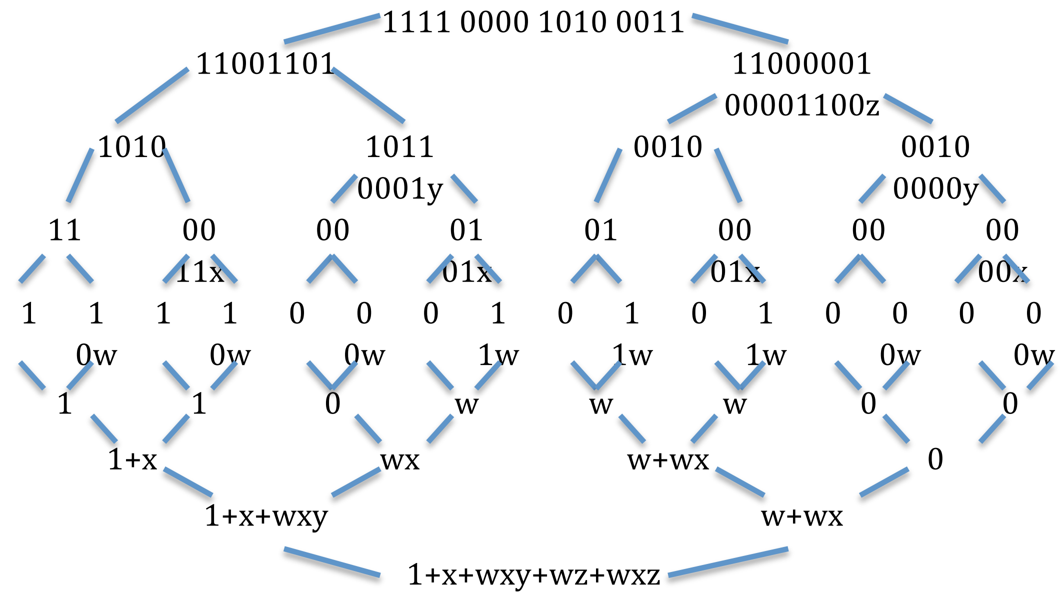
$LHS = (\overline{A \wedge B}) \barwedge c$
$= \overline{\overline{A \wedge B}} \vee \overline{C}$
$= A \wedge B \vee \overline{C}$
$RHS = A \barwedge (\overline{B \wedge C})$
$= \overline{A} \vee (\overline{\overline{B \wedge C}})$
$= \overline{A} \vee (B \wedge C)$
$\because LHS \neq RHS$
$\therefore (A \barwedge B) \barwedge C \neq A \barwedge (B \barwedge C)$

Hence, the nand operator $\barwedge$ is non-associative.

3.

x	y	$x \wedge y$	$\overline{\overline{x} \vee \overline{y}}$	$x \oplus y$	$x \vee y$	$x \oplus y \oplus (x \vee y)$
0	0	0	0	0	0	0
0	1	0	0	1	1	0
1	0	0	0	1	1	0
1	1	1	1	0	1	1

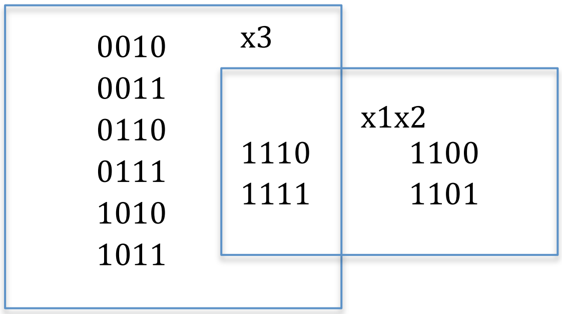
4.



5. a) if f(x1..0..x4)=1 than f(x1..1..x4)=1

So f is monotone.

b)



$The\ full\ disjunctive\ normal\ form\ is$

$f(x_1, x_2, x_3, x_4) = (\bar{x_1} \wedge \bar{x_2} \wedge x_3 \wedge \bar{x_4}) \vee (\bar{x_1} \wedge \bar{x_2} \wedge x_3 \wedge x_4) \vee (\bar{x_1} \wedge x_x \wedge x_3 \wedge \bar{x_4}) \vee (\bar{x_1} \wedge x_2 \wedge x_3 \wedge x_4) \vee (x_1 \wedge \bar{x_2} \wedge x_3 \wedge \bar{x_4}) \vee (x_1 \wedge \bar{x_2} \wedge x_3 \wedge x_4) \vee (x_1 \wedge x_2 \wedge \bar{x_3} \wedge \bar{x_4}) \vee (x_1 \wedge x_2 \wedge \bar{x_3} \wedge x_4) \vee (x_1 \wedge x_2 \wedge x_3 \wedge \bar{x_4}) \vee (x_1 \wedge x_2 \wedge x_3 \wedge x_4)$

$The\ shortest\ DFN\ is$

$f(x_1, x_2, x_3, x_4) = (x_1 \wedge x_2) \vee x_3$