CSC 355

A1

Q1. XOR $= \bar{A}B + A\bar{B}$ show $(\bar{A}+B)(A+\bar{B}) = \overline{\bar{A}B + A\bar{B}}$

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

$= (\overline{\bar{A}\bar{B}})(\overline{\bar{A}\cdot B})$ de morgan

$= (\overline{A\bar{B}})(\overline{\bar{A}\cdot B})$ involution

$= \overline{A\bar{B}}\,\overline{\bar{A}B}$ demorgan

$= A\bar{B} + \bar{A}B$ involution

$= \bar{A}B + A\bar{B}$ commutativity

Q2. a) $\bar{A}B + A\bar{B}$ compliment

$= (\bar{A}+B)(A+\bar{B})$ shown in q1

b) $\overline{(\bar{v}w + x)y + z}$

$= \overline{(\bar{v}w + x)y}\;\bar{z}$ de morgan

$= \overline{(\bar{v}w + x)} + \bar{y} + \bar{z}$ assoriativity

$= \overline{\bar{v}w + x + \bar{y}} + \bar{z}$ demorgan

$= (\overline{\bar{v}w + x + \bar{y}})\bar{z}$ involution

$= (\bar{v}w + x + \bar{y})z$ de Morgan

$= (\bar{v}w\bar{x} + \bar{y})z$ involution

$= (\bar{v}w\bar{x} + \bar{y})z$ distributivity

$= \bar{v}w\bar{x}z + \bar{y}z$

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A1

Q2. c) $wx(\bar{y}z + y\bar{z}) + \bar{w}\bar{x}(\bar{y} + z)(y + \bar{z})$ simplify before inverting

$= wx\bar{y}z + wxy\bar{z} + (\bar{w}\bar{x}\bar{y} + \bar{w}\bar{x}z)(y + \bar{z})$ distribute

$= wx\bar{y}z + wxy\bar{z} + \bar{w}\bar{x}\bar{y}y + \bar{w}\bar{x}yz + \bar{w}\bar{x}\bar{y}\bar{z} + \bar{w}\bar{x}z\bar{z}$ distribute

$= wx\bar{y}z + wxy\bar{z} + \bar{w}\bar{x}yz + \bar{w}\bar{x}\bar{y}\bar{z}$ complement

minterm form, make Karnaugh map

wx \ yz	00	01	11	10
00	1	0	1	0
01	0	0	0	0
11	0	1	0	1
10	0	0	0	0

we want inverse, group together zeroes

$= \bar{w}x + w\bar{x} + w\bar{y}\bar{z} + \bar{w}\bar{y}z + wyz + \bar{w}y\bar{z}$