CSE260

Digital Logical Design

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Assignment - 02

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Ans no 1

$$(A \oplus B)(C+D)(A \odot C) + (A+B)(C'+D)(A'+CC') \quad \text{---} (1)$$

Here, $A \oplus B = A'B + AB'$

$A \odot C = AC + A'C'$

Now (1) $\Rightarrow$

$$(A'B + AB')(C+D)(AC+A'C') + (A+B)(C'+D)(A'+CC')$$

$CC' = 0$; $A' + CC' = A'$

(1) $\Rightarrow$

$$(A'B + AB')(C+D)(AC + A'C') + (A+B)(C'+D)(A')$$

$$= (A'BC + A'BD + AB'C + AB'D)(AC + A'C') + (AC' + AD + BC' + BD)(A')$$

$$= (AA'BC + A'BCC' + AA'BCD + A'BC'D + AB'C + AA'B'CC' + AB'CD + AA'B'C'D) + (AA'C' + AA'D + A'BC' + A'BD)$$

$$= (A'BC'D + AB'C + AB'CD) + (A'BC' + A'BD) \quad [\because AA' = 0 \ \& \ ACC' = 0]$$

$$= A'BC'D + AB'C(1+D) + A'BC' + A'BD$$

$$= A'BC'D + AB'C + A'BC + A'BD$$

$$= A'B(C + D + C'D) + AB'C$$

Ans no 2

$$F = (x' + y + z')(x + y')(x' + z)$$

Using DeMorgan's ~~Law~~, Theorem,

$$F' = \left[(x' + y + z')(x + y')(x' + z)\right]'$$

$$\Rightarrow F' = (x' + y + z')' + (x + y')' + (x' + z)' \quad [\because (AB)' = A' + B']$$

$$\Rightarrow F' = \left((x')' \cdot y' \cdot (z')'\right) + \left(x' \cdot (y')'\right) + \left((x')' \cdot z'\right) \quad [\because (A+B)' = A'B']$$

$$\Rightarrow F' = xy'z + x'y + xz'$$

$$\Rightarrow F' = x(y'z + z') + x'y$$

$$\Rightarrow F' = x(y' + z')(z + z') + x'y$$

$$\Rightarrow F' = x(y' + z') + x'y \quad [\because z + z' = 1]$$

$$\Rightarrow F' = xy' + xz' + x'y$$

Ans no 3

SOP

consensus theorem,

$$AB + A'C + BC = AB + A'C$$

Comparing with $F = WY + WX + X'Y$,

$AB = WX$, $A'C = X'Y$, $BC = WY$

∴ ~~By consensus theorem,~~

$$F(V,W,X,Y,Z) = WY + WX + X'Y$$

$$= WY\left[(V+V')(X+X')(Z+Z')\right] + WX\left[(V+V')(Y+Y')(Z+Z')\right]$$
$$+ X'Y\left[(V+V')(W+W')(Z+Z')\right]$$

$$= WY\left(VXZ + VXZ' + VX'Z + VX'Z' + V'XZ + V'X'Z + V'XZ' + V'X'Z'\right)$$
$$+ WX\left(VYZ + VYZ' + V'YZ + V'YZ' + VY'Z + VY'Z' + V'Y'Z + V'Y'Z'\right)$$
$$+ X'Y\left(VWZ + VWZ' + V'WZ + V'WZ' + VW'Z + VW'Z' + V'W'Z + V'W'Z'\right)$$

$$= VWXYZ + VWXYZ' + VWX'YZ + VWX'YZ' + V'WXYZ +$$
$$V'WX'YZ + V'WXYZ' + V'WX'YZ + VWXYZ + VWXYZ' +$$
$$V'WXYZ + V'WXYZ' + VWXY'Z + VWXY'Z' + V'WXY'Z +$$
$$V'WXY'Z' + VWX'YZ + VWX'YZ' + V'WX'YZ + V'WX'YZ'$$
$$+ VW'X'YZ + VW'X'YZ' + V'W'X'YZ + V'W'X'YZ'$$
$$= VWXYZ + VWXYZ' + VWXY'Z + VWX'YZ + VWX'YZ'$$

(P.T.O)

$+ vwxy'z' + v'wxyz + v'wxyz' + v'wxy'z + v'wxy'z$
$+ v'wxy'z' + v'wx'yz' + vw'x'yz + vw'x'yz'$
$+ v'w'x'yz + v'w'x'yz'$

(Total 16 minterms) Ans.

POS Using consensus theorem,

$F = wx + x'y$ $[\because AB + A'C + BC = AB + A'C ;$
$AB = wx, A'C = x'y]$

Using distributive law $(A+BC = (A+B)(A+C)$:

$F = (wx + x')(wx + y)$
$= (w + x')(x + x')(w + y)(x + y)$ $[A+BC = (A+B)(A+C)]$
$= (w + x')(w + y)(x + y)$
$= (w + x' + vv')(w + y + vv')(x + y + vv')$ [Adding v]
$= (w + x' + v)(w + x' + v')(w + y + v)(w + y + v')(x + y + v)(x + y + v')$
$= (w + x' + v + yy')(w + x' + v' + yy')(w + y + v + xx')(w + y + v' + xx')$
$(x + y + v + ww')(x + y + v' + ww')$ [Adding w, y]
$= (w + x' + v + y)(w + x' + v + y')(w + x' + v' + y)(w + x' + v' + y')$
$(w + y + v + x)(w + y + v + x')(w + y + v' + x)(w + y + v' + x')$
$(x + y + v + w)(x + y + v + w')(x + y + v' + w)(x + y + v' + w')$

(P.T.O)

$= (w+x'+v+y+zz')(w+x'+v+y'+zz')(w+x'+v'+y+zz')$

$(w+x'+v'+y'+zz')(w+y+v+x+zz')(w+y+v+x'+zz')$

$(w+y+v'+x+zz')(w+y+v'+x'+zz')(x+y+v+w+zz')$

$(x+y+v+w'+zz')(x+y+v'+w+zz')(x+y+v'+w'+zz')$

[Adding z]

$= (w+x'+v+y+z)(w+x'+v+y+z')(w+x'+v+y'+z)(w+x'+v+y'+z')$

$(w+x'+v'+y+z)(w+x'+v'+y+z')(w+x'+v'+y'+z)(w+x'+v'+y'+z')$

$(w+y+v+x+z)(w+y+v+x+z')(w+y+v+x'+z)(w+y+v+x'+z')$

$(w+y+v'+x+z)(w+y+v'+x+z')(w+y+v'+x'+z)(w+y+v'+x'+z')$

$(x+y+v+w+z)(x+y+v+w+z')(x+y+v+w'+z)(x+y+v+w'+z')$

$(x+y+v'+w+z)(x+y+v'+w+z')(x+y+v'+w'+z)(x+y+v'+w'+z')$