Name- Ayush Jain
SAP ID- 60004200132
Div - B/B1

08/12/2021

Digital Electronics ITI

1.> Simplify : $\bar{A}(A+B) + (B+AA)(A+\bar{B})$

$\rightarrow$ $\bar{A}(A+B) + (B+AA)(A+\bar{B})$

$= \bar{A}\cdot A + \bar{A}\cdot B + (B+A)(A+\bar{B})$ ... [Distributive law and $A\cdot A = A$]

$= 0 + \bar{A}\cdot B + B\cdot A + B\cdot\bar{B} + A\cdot A + A\bar{B}$ ... [Distributive law]

$= \bar{A}\cdot B + A\cdot B + 0 + A + A\bar{B}$ ... $(A\cdot A = A,\ A\cdot\bar{A} = 0,\ B\cdot\bar{B} = 0)$

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

$= (\bar{A}+A)B + A(1+\bar{B})$ ... [Distributive law]

$= (1)B + A(1)$ ... $[\bar{A}+A = 1,\ 1+\bar{B} = 1]$

$= B + A$

$= A + B$

$\therefore$ $\boxed{\bar{A}(A+B) + (B+AA)(A+\bar{B}) = A+B}$

$\rightarrow$ ~~2>~~

→2) $f(A,B,C,D) = \Sigma m(2,6,8,9,10,11,14,15)$

Group	Minterms	Binary Representation			
		A	B	C	D
1	m_2	0	0	1	0
	m_8	1	0	0	0
2	m_6	0	1	1	0
	m_9	1	0	0	1
	m_{10}	1	0	1	0
3	m_{11}	1	0	1	1
	m_{14}	1	1	1	0
4	m_{15}	1	1	1	1

Group	Matched Pairs	Binary Representation			
		A	B	C	D
1	$m_2 - m_6$	0	—	1	0
	$m_2 - m_{10}$	—	0	1	0
	$m_8 - m_9$	1	0	0	—
	$m_8 - m_{10}$	1	0	—	0
2	$m_6 - m_{14}$	—	1	1	0
	$m_9 - m_{11}$	1	0	—	1
	$m_{10} - m_{11}$	1	0	1	—
	$m_{10} - m_{14}$	1	—	1	0
3	$m_{11} - m_{15}$	1	—	1	1
	$m_{14} - m_{15}$	1	1	1	—

Group	Matched Pairs	Binary representation			
		A	B	C	D
1	m2 - m6 - m10 - m14	–	–	1	0
	m2 - m10 - m6 - m14	–	–	1	0
	m8 - m9 - m10 - m11	1	0	–	–
	m8 - m10 - m9 - m11	1	0	–	–
2	m10 - m14 - m11 - m15	1	–	1	–
	m10 - m11 - m14 - m15	1	–	1	–

} $C\bar{D}$

} $A\bar{B}$

} AC

Prime implicant table.

P.I	Minterms involved	2	6	8	9	10	11	14	15
$C\bar{D}$	2, 6, 10, 14	X	X			X		X	
$A\bar{B}$	8, 9, 10, 11			X	X	X	X		
AC	10, 11, 14, 15					X	X	X	X

$\therefore$ $F = C\bar{D} + A\bar{B} + AC$ is the simplified form using Quine - McCluskey tabular method.

3) $F(A,B,C,D) = \Sigma m(1,3,4,6,9,11,12,14)$

AB \ CD	00	01	11	10
00		1	1	
01	1			1
11	1			1
10		1	1	

NOW,

$F(A,B,C,D) = (A'B + AB)(C'D' + CD') + (A'B' + AB')(C'D + CD)$

$= BD' + B'D$

$= B \oplus D$

$\therefore \boxed{F(A,B,C,D) = B \oplus D}$

4) BCD subtraction of 541 Base 10 − 216 base 10

541 $\xrightarrow{BCD}$ 0101 0100 0001

216 $\xrightarrow{BCD}$ 0010 0001 0110

On 9's complement of 216

$\therefore$

$$\begin{array}{r} 999 \\ -216 \\ \hline 783 \end{array}$$

541	$\xrightarrow{BCD}$		0101	0100	0001
783	$\xrightarrow{BCD}$	+	0111	1000	0011
Addition			1100	1100	0100
			Invalid BCD	Invalid BCD	valid BCD
Adding 6 (0110)			0110	0110	
		1	0010	0010	0100

carry

∴ 1 0011 0010 0100

0011	0010	0100
3	2	4
		+ 1
3	2	5

∴ $\boxed{(541)_{base 10} - (216)_{base 10} = (325)_{base 10}}$

5) Subtraction of 1B06 and 77C using 16's complement

15's complement of 77C

	F	F	F	F
-	0	7	7	C
	F	8	8	3

16's complement of 077C = 15's complement + 1
= F883 + 1
= F884

$\therefore$

	1	B	0	6
+	F	8	8	4
①	1	3	8	A

Discard

1 3 8 A

$\therefore$ $\boxed{1B06 - 077C = 138A}$

6)

(i) $(2724)_8 = (\ \ )_5$

Converting $(2724)_8$ to decimal

$2724 = (2 \times 8^3 + 7 \times 8^2 + 2 \times 8^1 + 4 \times 8^0)_{10}$

$= (2 \times 512 + 7 \times 64 + 2 \times 8 + 4)_{10}$

$= (1024 + 448 + 16 + 4)_{10}$

$= (1492)_{10}$

$\therefore$ $(2724)_8 = (1492)_{10}$

Converting $(1492)_{10} \longrightarrow (\ )_5$

5	1492	
5	298	2
5	59	3
5	11	4
	2	1
		2

$= (21432)_5$

$\therefore \boxed{(2724)_8 = (21432)_5}$

<2> 1001001100 base 2 = ( ) base 6

Converting $(1001001100)_2$ to decimal

$= 1\times 2^9 + 1\times 2^6 + 1\times 2^3 + 1\times 2^2$

$= 512 + 64 + 8 + 4$

$= 588$

$\therefore (1001001100)_2 = (588)_{10}$

Converting to ( ) base 6

6	588	
6	98	0
6	16	2
	2	4
		2

$= (2420)_6$

$\therefore \boxed{(1001001100)_2 = (2420)_6}$

(3) $(AC.FBA5)_{16} = (\ )_{base\ 10}$

$$\begin{array}{cccccc} 1 & 0 & -1 & -2 & -3 & -4 \\ A & C\ . & F & B & A & 5 \end{array}$$

$$10 \times 16 + 12 \times 16^0 + 15 \times \frac{1}{16} + 11 \times \frac{1}{16^2} + 10 \times \frac{1}{16^3} + 5 \times \frac{1}{16^4}$$

$= (172.98298)_{10}$

$\therefore$ $\boxed{(AC.FBA5)_{16} = (172.98298)_{10}}$