3rd/Jan/2021

Abdul Rafeh 104-2C DLD HomeWork

Q:1 in $F(A,B,C,D) = \Sigma(4,6,7,15)$

Solution:-

$$F(A,B,C,D) = \Sigma(4,6,7,15)$$

So:

$$[\because \overset{8}{A}\ \overset{4}{B}\ \overset{2}{C}\ \overset{1}{D}]$$

$$F(A,B,C,D) = \bar{A}B\bar{C}\bar{D} + \bar{A}BC\bar{D} + \bar{A}BCD + ABCD$$

So, Now;

AB \ CD	$\bar{C}\bar{D}$	$\bar{C}D$	CD	$C\bar{D}$
$\bar{A}\bar{B}$	$\bar{A}\bar{B}\bar{C}\bar{D}$	$\bar{A}\bar{B}\bar{B}\bar{D}$	$\bar{A}\bar{B}CD$	$\bar{A}\bar{B}C\bar{D}$
$\bar{A}B$	$\bar{A}B\bar{C}\bar{D}$	$\bar{A}B\bar{C}D$	$\bar{A}BCD$	$\bar{A}BC\bar{D}$
AB	$AB\bar{C}\bar{D}$	$AB\bar{C}D$	$ABCD$	$ABC\bar{D}$
$A\bar{B}$	$A\bar{B}\bar{C}\bar{D}$	$A\bar{B}\bar{C}D$	$A\bar{B}CD$	$A\bar{B}C\bar{D}$

AB \ CD	$\bar{C}\bar{D}$	$\bar{C}D$	CD	$C\bar{D}$
$\bar{A}\bar{B}$	0	1	3	2
$\bar{A}B$	4	5	7	6
AB	12	13	15	14
$A\bar{B}$	8	9	11	10

So;

AB \ CD	$\bar{C}\bar{D}$	$\bar{C}D$	CD	$C\bar{D}$
$\bar{A}\bar{B}$	0000	0001	0011	0010
$\bar{A}B$	0100	0101	0111	0110
AB	1100	1101	1111	1110
$A\bar{B}$	1000	1001	1011	1010

AB \ CD	$\bar{C}\bar{D}$	$\bar{C}D$	CD	$C\bar{D}$
$\bar{A}\bar{B}$				
$\bar{A}B$	1		1	1
AB			1	
$A\bar{B}$				

So here;

$$(\bar{A}B\bar{C}\bar{D})(\bar{A}BC\bar{D})$$

So here;

$$ABD$$

1st Pair;

$$\boxed{ABD}$$

2nd Pair;

$$(\bar{A}BCD).(ABCD)$$

$$\boxed{BCD}$$ Ans

$\because \bar{A}.\bar{A} = A$
$\because \bar{B}.\bar{B} = 1$
$\because \bar{C}.\bar{C} = C$
$\because A.A = A$
$\because \bar{D}.\bar{D} = 0$
$\because \bar{D}.D = 1$
$\because DD = 0$

So finally;

$$\boxed{ABD + BCD}$$ Ans

Q:2:~ $F(A,B,C,D) = \Sigma(3,7,11,13,14,15)$

Solution:

$$F(A,B,C,D) = \Sigma(3,7,11,13,14,15)$$

$$\left[\because \overset{8}{A}\ \overset{4}{B}\ \overset{2}{C}\ \overset{1}{D}\right]$$

$$F(A,B,C,D) = \bar{A}\bar{B}CD + \bar{A}BCD + A\bar{B}CD + AB\bar{C}D + ABC\bar{D} + ABCD$$

So Now;

Continued Next Pg

$AB \backslash CD$	$\bar{C}\bar{D}$	$\bar{C}D$	CD	$C\bar{D}$
$\bar{A}\bar{B}$	$\bar{A}\bar{B}\bar{C}\bar{D}$	$\bar{A}\bar{B}\bar{C}D$	$\bar{A}\bar{B}CD$	$\bar{A}\bar{B}C\bar{D}$
$\bar{A}B$	$\bar{A}B\bar{C}\bar{D}$	$\bar{A}B\bar{C}D$	$\bar{A}BCD$	$\bar{A}BC\bar{D}$
AB	$AB\bar{C}\bar{D}$	$AB\bar{C}D$	$ABCD$	$ABC\bar{D}$
$A\bar{B}$	$A\bar{B}\bar{C}\bar{D}$	$A\bar{B}\bar{C}D$	$A\bar{B}CD$	$A\bar{B}C\bar{D}$

So; CD

$AB \backslash CD$	$\bar{C}\bar{D}$	$\bar{C}D$	CD	$C\bar{D}$
$\bar{A}\bar{B}$	0	1	3	2
$\bar{A}B$	4	5	7	6
AB	12	13	15	14
$A\bar{B}$	8	9	11	10

So here;

$AB \backslash CD$	$\bar{C}\bar{D}$	$\bar{C}D$	CD	$C\bar{D}$
$\bar{A}\bar{B}$	0000	0001	0011	0010
$\bar{A}B$	0100	0101	0111	0110
AB	1100	1101	1111	1110
$A\bar{B}$	1000	1001	1011	1010

So finally;

$AB \backslash CD$	$\bar{C}\bar{D}$	$\bar{C}D$	CD	$C\bar{D}$
$\bar{A}\bar{B}$			1	
$\bar{A}B$			1	
AB		1	1	1
$A\bar{B}$			1	

$$\left[\begin{array}{l} \because \bar{A}.\bar{A} = A \\ \because \bar{A}.A = 1 \\ \because \bar{B}.B = 1 \\ \because \bar{B}.\bar{B} = B \\ \because A.A = B \\ \because \bar{C}\bar{C} = A \\ \because C.C = C \\ \because \bar{C}.C = 1 \end{array}\right]$$

So here;

1st Pair; $(AB\bar{C}D)(ABCD)$

$\boxed{ABD}$

2nd Pair; $(ABCD)(ABC\bar{D})$

$\boxed{ABC}$

So finally;

3rd Pair; $(\bar{A}\bar{B}CD)(\bar{A}BCD)(ABCD)(A\bar{B}CD)$

$\boxed{CD}$

finally;

$$\boxed{ABD + ABC + CD}$$

Ans

Q:3:- $F(A,B,C,D) = \Sigma(0,1,5,8,9)$

Solution:

$$F(A,B,C,D) = \Sigma(0,1,5,8,9)$$

$$\left[\because \overset{8}{A}\ \overset{4}{B}\ \overset{2}{C}\ \overset{1}{D}\right]$$

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

So Now;

AB \ CD	$\bar{C}\bar{D}$	$\bar{C}D$	CD	$C\bar{D}$
$\bar{A}\bar{B}$	$\bar{A}\bar{B}\bar{C}\bar{D}$	$\bar{A}\bar{B}\bar{C}D$	$\bar{A}\bar{B}CD$	$\bar{A}\bar{B}C\bar{D}$
$\bar{A}B$	$\bar{A}B\bar{C}\bar{D}$	$\bar{A}B\bar{C}D$	$\bar{A}BCD$	$\bar{A}BC\bar{D}$
AB	$AB\bar{C}\bar{D}$	$AB\bar{C}D$	$ABCD$	$ABC\bar{D}$
$A\bar{B}$	$A\bar{B}\bar{C}\bar{D}$	$A\bar{B}\bar{C}D$	$A\bar{B}CD$	$A\bar{B}C\bar{D}$

Then;

AB \ CD	$\bar{C}\bar{D}$	$\bar{C}D$	CD	$C\bar{D}$
$\bar{A}\bar{B}$	0	1	3	2
$\bar{A}B$	4	5	7	6
AB	12	13	15	14
$A\bar{B}$	8	9	11	10

and;

AB \ CD	$\bar{C}\bar{D}$	$\bar{C}D$	CD	$C\bar{D}$
$\bar{A}\bar{B}$	1	1		
$\bar{A}B$		1		
AB				
$A\bar{B}$	1	1		

So here is 3 Pairs

1st Pair;

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

$= \boxed{ABC}$

2nd Pair;

$(\bar{A}\bar{B}\bar{C}D)(\bar{A}B\bar{C}D)$

(ACD)

$\boxed{ACD}$

3rd Pair;

$(A\bar{B}\bar{C}\bar{D})(A\bar{B}\bar{C}D)$

$\boxed{ABC}$

So finally;

$$\boxed{\begin{array}{l} ABC + ACD + ABC \\ 2ABC + ACD \end{array}}$$

Q. 4:~ $F(A,B,C,D) = \Sigma(1,4,5,6,12,14,15)$

Solution:

$F(A,B,C,D) = \Sigma(1,4,5,6,12,14,15)$

$\because [\overset{8}{A}\ \overset{4}{B}\ \overset{2}{C}\ \overset{1}{D}]$

Then:

$F(A,B,C,D) = \bar{A}\bar{B}\bar{C}D + \bar{A}B\bar{C}\bar{D} + \bar{A}B\bar{C}D +$
$\bar{A}BC\bar{D} + AB\bar{C}\bar{D} + ABC\bar{D} + ABCD$

So;

AB \ CD	$\bar{C}\bar{D}$	$\bar{C}D$	CD	$C\bar{D}$
$\bar{A}\bar{B}$	$\bar{A}\bar{B}\bar{C}\bar{D}$	$\bar{A}\bar{B}\bar{C}D$	$\bar{A}\bar{B}CD$	$\bar{A}\bar{B}C\bar{D}$
$\bar{A}B$	$\bar{A}B\bar{C}\bar{D}$	$\bar{A}B\bar{C}D$	$\bar{A}BCD$	$\bar{A}BC\bar{D}$
AB	$AB\bar{C}\bar{D}$	$AB\bar{C}D$	$ABCD$	$ABC\bar{D}$
$A\bar{B}$	$A\bar{B}\bar{C}\bar{D}$	$A\bar{B}\bar{C}D$	$A\bar{B}CD$	$A\bar{B}C\bar{D}$

So;

AB \ CD	$\bar{C}\bar{D}$	$\bar{C}D$	CD	$C\bar{D}$
$\bar{A}\bar{B}$	0	1	3	2
$\bar{A}B$	4	5	7	6
AB	12	13	15	14
$A\bar{B}$	8	9	11	10

Finally;

AB \ CD	$\bar{C}\bar{D}$	$\bar{C}D$	CD	$C\bar{D}$
$\bar{A}\bar{B}$	0000	0001	0011	0010
$\bar{A}B$	0100	0101	0111	0110
AB	1100	1100	1111	1110
$A\bar{B}$	1000	1001	1011	1010

and:

$AB \backslash CD$	$\bar{C}\bar{D}$	$\bar{C}D$	CD	$C\bar{D}$
$\bar{A}\bar{B}$		1		
$\bar{A}B$	1	1		1
AB	1		1	1
$A\bar{B}$				

finally so here is 3 Pairs;

1st Pair;

$(\bar{A}B\bar{C}\bar{D}).(AB\bar{C}\bar{D}).(\bar{A}BC\bar{D}).(ABC\bar{D})$

(BD)

$\boxed{BD}$

2nd Pair;

$= (\bar{A}\bar{B}\bar{C}D).(\bar{A}B\bar{C}D)$

$= (ACD)$

$\boxed{ACD}$

3rd Pairs.

$(ABC\bar{D}).(ABCD)$

(ABC)

$\boxed{ABC}$

So finally;

$\boxed{BD + ACD + ABC}$

Ans