Manisi Uniyal   Assignment 3.

19EE10039.

Q1. $F(A,B,C,D,E) = \sum m(0,2,8,10,11,13,16,18,24,26,29)$
$$+ \sum d(5,6,9,14,21,22,30).$$

AB \ CDE	000	001	011	010	110	111	101	100
00	1₀	1	3	1₂	×₆	∖₇	×₅	4
01	1₈	×₉	1₁₁	1₁₀	×₁₄	15	1₁₃	12
10	1₄	15	27	1₂₆	×₃₀	31	1₂₉	28
10	1₁₆	17	19	1₁₈	×₂₂	23	×₂₀	20

ans→ $F(A,B,C,D,E) = C'D'E' + CDE' + CD'E + C'A'B.$
$$\underset{\equiv}{} C'E' + A'BC' + CD'E$$

Q2.

C_1C_2 \ X_1X_2	00	01	11	10
00	0	1	1	1
01	0	1	0	1
11	1	0	1	0
10	0	0	1	0

ans→ $F(C_1,C_2,X_1,X_2) = C_1 C_2 X_1'X_2' + C_1'X_1'X_2 + C_1 X_2 X_1$
$$+ C_1'C_2'X_2 + C_1 X_1 X_2'$$

Q3. $F(a,b,c) = \sum m(1,3,6,7).$

ab \ c	0	1
00	0₀	1₁
01	2	1₃
11	1₆	1₇
10	4	5

Prime implicants.
$= AB + BC + A'C.$

	1	3	6	7
AB			✓	✓
BC		✓		✓
A'C	✓	✓		

essential prime $\Big\{$ (AB) (BC) (A'C)

→ BC is reductant

Q4. $F(A,B,C,D) = \Sigma m(0,2,5,6,13,14) + \Sigma d(8,9)$.

AB\CD	00	01	11	10
00	1	0	0	1
01	0	1	0	1
11	0	1	0	1
10	X	X	0	0

$f(ABCD) = A'B'D'$
$\quad + BC'D$
$\quad + BCD'$
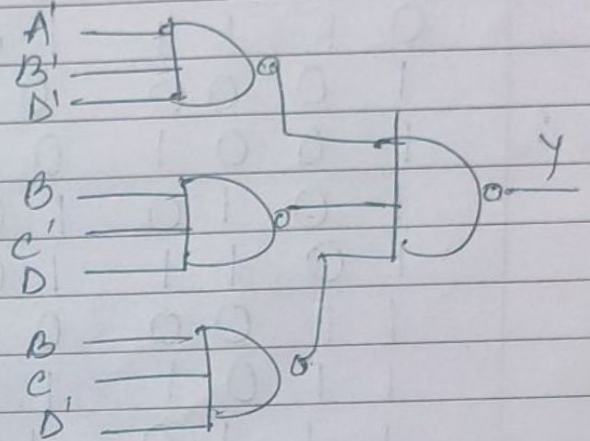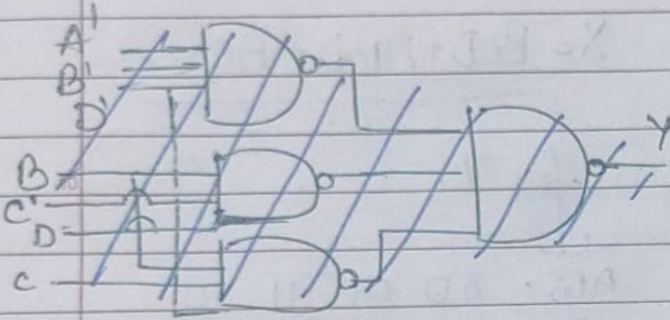
Q5. $F(a,b,c,d) = \Sigma m(1,2,3,4,5) + \Sigma d(12,13,14,15)$.

Stage 1.   Stage 2.   Stage 3

A B C D   A B C D.

A	B	C	D	
0	0	0	1	(1)
0	0	1	0	(2)
0	1	0	0	(4)
0	0	1	1	(3)
0	1	0	1	(5)
1	0	0	0	(12)
1	1	0	1	(13)
1	1	1	0	(14)
1	1	1	1	(15)

Stage 2:

0	0	_	1	(13)
0	_	0	1	(15)
0	0	1	_	(23)
0	1	0	_	(45)
_	1	0	0	(4 12)
_	1	0	1	(5 12)
1	1	0	_	(12 13)
1	1	_	0	(12 14)
1	1	_	1	(13 15)
1	1	1	_	(14 15)

Stage 3:

_	1	0	_	(4,5,12,13)
_	1	0	_	(4,12,5,13)
1	1	_	_	(12,13,14,15)
1	1	_	_	(13,14,13,15)

A'B'C	0 0 1 _	(2,3)
AB'D	0 0 _ 1	(1,3)
Ac'D	0 _ 0 1	(1,5)
BC'	_ 1 0 _	(4,5,12,13)
AB'	1 1 _ _	(12,13,14,15)

minimal set = $A'B'D + BC'$
$\quad + A'BC'$
$\quad + A'B'C$

Q6.

A	B	C	D	X	Y	Z
0	0	0	0	0	0	0
0	0	0	1	0	0	1
0	0	1	0	0	1	0
0	0	1	1	0	1	1
0	1	0	0	0	0	1
0	1	0	1	0	1	0
0	1	1	0	0	1	1
0	1	1	1	1	0	0
1	0	0	0	0	1	0
1	0	0	1	0	1	1
1	0	1	0	1	0	0
1	0	1	1	1	0	1
1	1	0	0	0	1	1
1	1	0	1	1	0	0
1	1	1	0	1	0	1
1	1	1	1	1	1	0

for X.

AB＼CD	00	01	11	10
00	0	0	0	0
01	0	0	1	0
11	0	1	1	1
10	0	0	1	1

$$X = BCD + ABD + AC$$

for Y.

AB＼CD	00	01	11	10
00	0	0	1	1
01	0	1	0	1
11	1	0	1	0
10	1	1	0	0

$$Y = AC'D' + AB'C' + A'BC'D + ABCD + A'B'C + A'CD'$$

for Z.

AB＼CD	00	01	11	10
00	0	1	1	0
01	1	0	0	1
11	1	0	0	1
10	0	1	1	0

$$Z = BD' + B'D$$

Q7. $G = (CD)'A(E+F) + (CD)B(E+F)'$

$$= (D' + C')(AE + AF) + BCDE'F'$$

$$G = AC'E + AD'E + AC'F + AD'F + BCDE'F'$$

$$H = [A'(CD) + (A+C)(E+F)] \cdot B$$

$$H = (A'CD + AE + AF + CE + CF)B$$

$$H = A'BCD + ABE + ABF + BCE + BCF$$

Q8. (a) $F(W X Y Z) = ?$ $= XZ' + W'Y'Z + WXY$

WX\YZ	00	01	11	10
00	0	1	0	0
01	1	1	0	1
11	1	0	1	1
10	0	0	0	0

(b) $F(X,Y,Z) = XY + X'Y'Z' + X'YZ'$

XY\Z	0	1
00	1	0
01	1	0
11	1	1
10	0	0

$F(X,Y,Z) = X'Z' + XY.$

Q9.

digit	A	B	C	D	W	X	Y	Z
0	0	0	0	0	0	0	0	0
1	0	0	0	1	0	1	1	1
2	0	0	1	0	0	1	1	0
3	0	0	1	1	0	1	0	1
4	0	1	0	0	0	1	0	0
5	0	1	0	1	1	0	1	1
6	0	1	1	0	1	0	1	0
7	0	1	1	1	1	0	0	1
8	1	0	0	0	1	0	0	0
9	1	0	0	1	1	1	1	1

for A.

WX\YZ	00	01	11	10
00				
01				
11				1
10		1		

$A = WX'Y'Z' + WXYZ.$

for B.

WX\YZ	00	01	11	10
00				
01		1		
11				
10			1	1	1

$B = W'XYZ' + WX'Z + WX'Y$

for C

WX \ YZ	00	01	11	10
00				
01		(1)	(1)	
11				
10		(1)	(1)	

$$C = W'XY'Z + W'XYZ'$$
$$+ WX'Y'Z + WX'YZ'$$

for D.

WX \ YZ	00	01	11	10
00				
01			(1	1)
11			(1)	
10			(1	1)

$$D = W'XZ + WX'Z$$
$$+ WYZ.$$

Q10: $F(A,B,C,D) = \Pi M(2,3,6,8,9,12,13,14)$.

AB \ CD	00	01	11	10
A+B 00	0	1	(0	0)
A+B' 01	4	5	7	(0) 6
A'+B' 11	(0) 12	(0) 13	15	(0) 14
A'+B 10	(0) 8	(0) 9	11	10

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

Q11.

A \ BC	00	01	11	10
0	DE	D'+DE	E'	E'+E
1	x	x	0	E

A \ BC	00	01	11	10
0	DE	D	E'	1
1	x	x	0	E

total 4 grps

$$F(A,B,C,D,E) = B'DE + B'CDE' + A'BE + BC'E.$$