Mansi Uniyal   Assignment 3.
19EE10039.

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

AB \ CDE	000	001	011	010	110	111	101	100
00	1₀	1	3	1₂	X 6	7	X 5	4
01	1₈	X₉	1 11	1₁₀	X 14	15	1 13	12
1⌀	1 24	15	27	1 26	X 30	31	1 29	28
10	1₁₆	17	19	1₁₈	X 22	23.	X 2	20

Ans → $F(A,B,C,D,E) = C'D'E' + DE' + CD'E + C'A'B.$

Q2.

$c_1 c_2$ \ $x_1 x_2$	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 → $F(c_1, c_2, x_1, x_2) = c_1 c_2 x_1' x_2' + c_1' x_1' x_2 + c_1 x_2 x_1$
$\qquad + c_1' c_2' x_2 + c_1' x_1 x_2'$

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

ab \ c	0	1
00	0	1
01	2	1 3
11		1
10	1 6	7

| | 4 | 5 |

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

	1	3	6	7
AB (essential prime)			✓	✓
BC		✓		✓
A'C (essential prime)	✓	✓		

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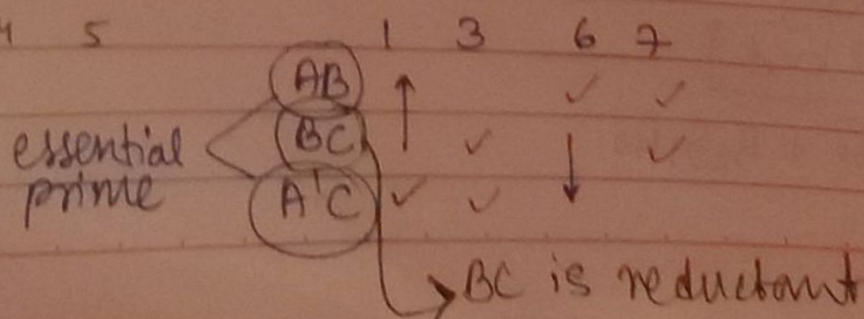
Q4. $F(A,B,C,D) = \sum m (0,2,5,6,13,14) + \sum d(8,9)$.

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

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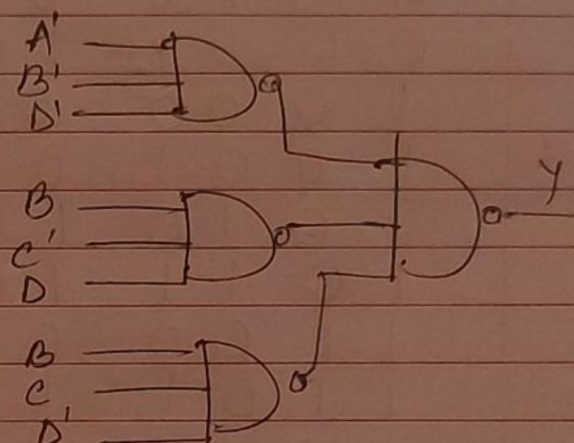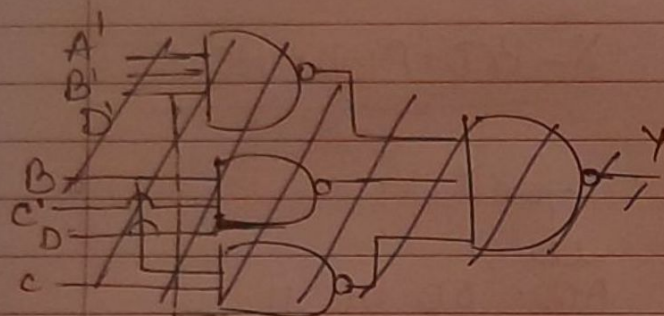
Q5. $F(a,b,c,d) = \sum m (1,2,3,4,5) + \sum d(12,13,14,15)$.

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

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

minimal set = $A'B'D + BC'$
$+ A'BC'$

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) $F(WXYZ) = ? \qquad = Xz' + W'Y'z + WXY.$

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	3 ⓪	2 ⓪
A+B' 01	4	5	7	6 ⓪
A'+B' 11	12 ⓪	13 ⓪	15	14 ⓪
A'+B 10	8 ⓪	9 ⓪	11	10

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

Q11.

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

A\BC	00	01	11	10
0	DE	D	Ē	1
1	x	x	0	E

total
4 grps

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