

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 | 1 ₀ | 1 | 3 | 1 ₂ | X | 6 | X | 4 |
| 01 | 1 ₈ | X | 1 ₁₁ | 1 ₁₀ | X | 14 | 1 ₁₃ | 12 |
| 10 | 1 ₄ | 15 | 27 | 1 ₂₆ | X | 30 | 1 ₂₉ | 28 |
| 11 | 1 ₁₆ | 19 | 18 | 1 ₁₈ | X | 22 | X | 20 |

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

Q2.

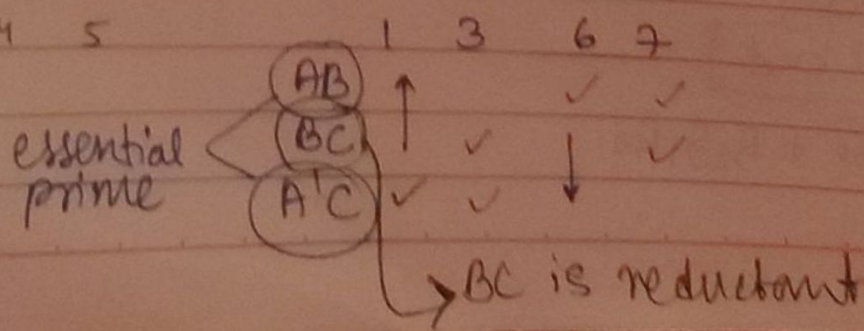
| $C_1 C_2$ \ $X_1 X_2$ | 00 | 01 | 11 | 10 |
|-----------------------|----|----|----|----|
| 00 | 0 | 1 | 1 | 1 |
| 01 | 0 | 1 | 0 | 1 |
| 11 | 1 | 0 | 1 | 0 |
| 10 | 0 | 0 | 1 | 0 |

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

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

| ab \ c | 0 | 1 |
|--------|---|---|
| 00 | 0 | 1 |
| 01 | 2 | 3 |
| 11 | 6 | 7 |
| 10 | 4 | 5 |

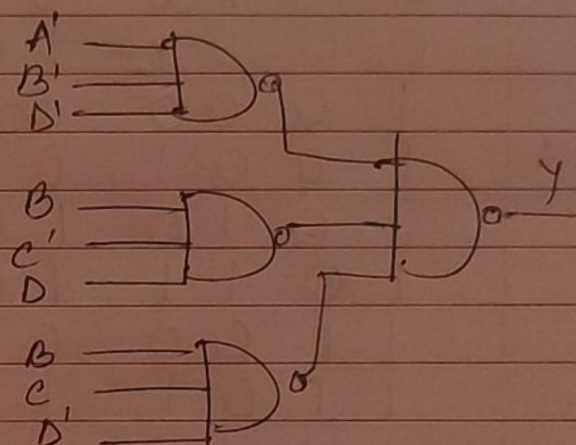
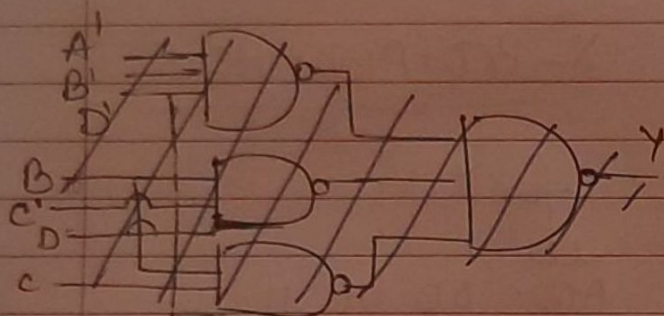
Prime implicants.
 $= AB + BC + A'C$



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 |

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



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 |
|--------------|----------------|-----------------------|
| AB CD | AB CD | |
| 0 0 0 1 (1) | 0 0 _ 1 (13) | |
| 0 0 1 0 (2) | 0 _ 0 1 (15) | |
| 0 1 0 0 (4) | 0 0 1 _ (23) | - 1 0 _ (4,5,12,13) |
| 0 0 1 1 (3) | 0 1 0 _ (45) | - 1 0 _ (4,12,5,13) |
| 0 1 0 1 (5) | - 1 0 0 (412) | 1 1 _ _ (12,13,14,15) |
| 1 1 0 0 (12) | - 1 0 1 (512) | 1 1 _ _ (12,14,13,15) |
| 1 1 0 1 (13) | 1 1 0 _ (1213) | |
| 1 1 1 0 (14) | 1 1 _ 0 (1214) | |
| 1 1 1 1 (15) | 1 1 _ 1 (1315) | |
| | 1 1 1 _ (1415) | |

| | | |
|-------|---------|---------------|
| 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) |

$$\text{minimal set} = A'B'D + BC' + A'BC'$$

Q6.

A B C D X Y Z.

for X.

| | | | | | | |
|---|---|---|---|---|---|---|
| 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 |

| | | | | | |
|---------------|----|----|----|----|---|
| CD | | | | | |
| AB | 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.

| | | | | | | |
|---|---|---|---|---|---|---|
| 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 |

| | | | | | |
|---------------|----|----|----|----|---|
| CD | | | | | |
| AB | 00 | 01 | 11 | 10 | |
| | 00 | 0 | 0 | 1 | 1 |
| | 01 | 0 | 1 | 0 | 1 |
| | 11 | 1 | 0 | 1 | 0 |
| | 10 | 1 | 1 | 0 | 0 |

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

for Z.

| | | | | | |
|---------------|----|----|----|----|---|
| CD | | | | | |
| AB | 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. $G = (CD)'A(E+F) + (CD)B(E+F)'$
 $= (D'+C')(AE+AF) + BCDEF'$

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

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

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

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

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

| 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 |

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

for C

| $\frac{YZ}{WX}$ | 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

| $\frac{YZ}{WX}$ | 00 | 01 | 11 | 10 |
|-----------------|----|----|----|----|
| 00 | | | | |
| 01 | | 1 | 1 | |
| 11 | | | 1 | |
| 10 | | 1 | 1 | |

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

Q 10. $F(A,B,C,D) = \Pi M(2,3,6,8,9,12,13,14)$

| $\frac{CD}{AB}$ | 00 | 01 | 11 | 10 |
|-----------------|----|----|----|----|
| 00 | 0 | 1 | 3 | 2 |
| 01 | 4 | 5 | 7 | 6 |
| 11 | 12 | 13 | 15 | 14 |
| 10 | 8 | 9 | 11 | 10 |

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

Q 11.

| $\frac{BC}{A}$ | 00 | 01 | 11 | 10 |
|----------------|----|-------|-----------|-------------|
| 0 | DE | DE+DE | \bar{E} | $\bar{E}+E$ |
| 1 | X | X | 0 | E |

| $\frac{BC}{A}$ | 00 | 01 | 11 | 10 |
|----------------|----|----|-----------|----|
| 0 | DE | D | \bar{E} | 1 |
| 1 | X | X | 0 | E |

that 4 groups

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