

ANU ANAND ANNU

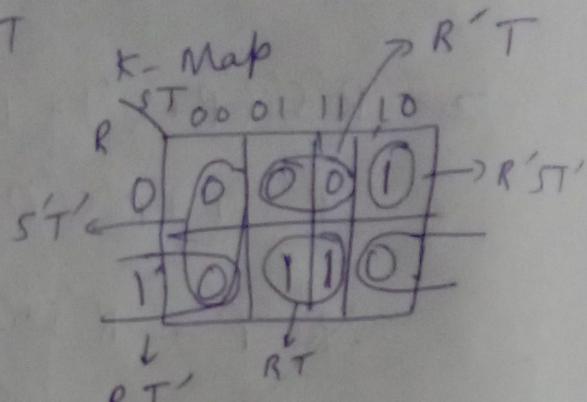
CS19B049

BEE
H.W. - 5

1) $F = R'ST' + RS'T + RST$

a)

$$F = RT + R'ST'$$



b) $F' = S'T' + R'T + RT'$

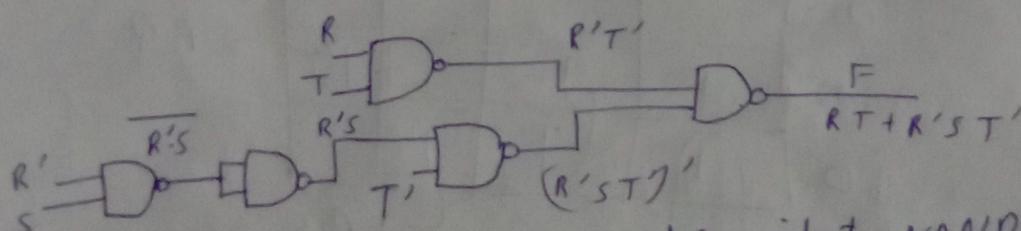
$$F = (F')' = (S'T' + R'T + RT')'$$

$$= (S'T')'(R'T)'(RT')'$$

$$= (S+T)(R'+T')(R'T)$$

c) Using 2-input NAND gates

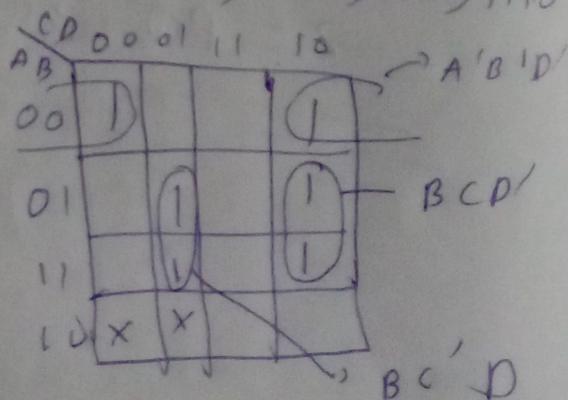
$$\overline{F} = \overline{\overline{RT} + \overline{RST}}$$



Min no. of 2-input NAND gates = 5

2) Relay trans on for $\rightarrow 0000, 0010, 0101, 0110, 1101, 1110$
Don't care $\rightarrow 1000, 1001$

$$F = A'B'D' + BCD' + BC'D$$

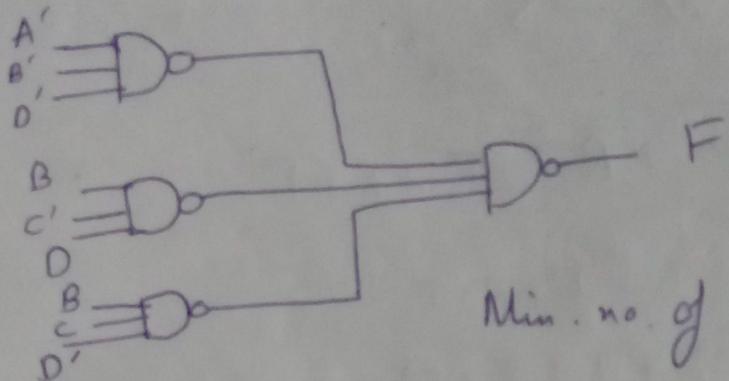


$$\text{Equation} \Rightarrow A'B'D' + BC'D + BCD' = F$$

Using 3-input NAND gates \Rightarrow

$$F = \overline{\overline{A}\overline{B}\overline{D}} + \overline{BC\overline{D}} + \overline{B\overline{C}D}$$

$$\left. \begin{array}{c} \overline{A}\overline{B}\overline{D} \\ \overline{BC\overline{D}} \\ \overline{B\overline{C}D} \end{array} \right\} N_4$$

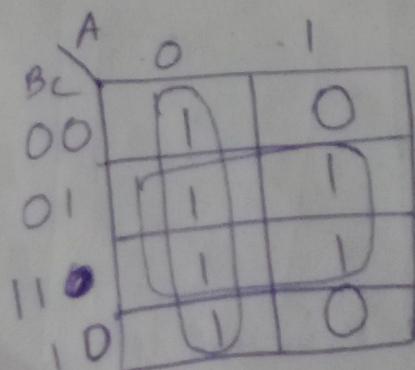


Min. no. of NAND gates = 4.

3) a) Truth Table

| A | B | C | F |
|---|---|---|---|
| 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 1 |
| 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 |

b) F as a ~~Sum~~ SOP



$$F = C + A' \Rightarrow \text{SOP}$$

c) $F \Leftrightarrow POS$

| | 0 | 1 |
|----|---|-----|
| 00 | 1 | (0) |
| 01 | 1 | 1 |
| 11 | 1 | 1 |
| 10 | 1 | (0) |

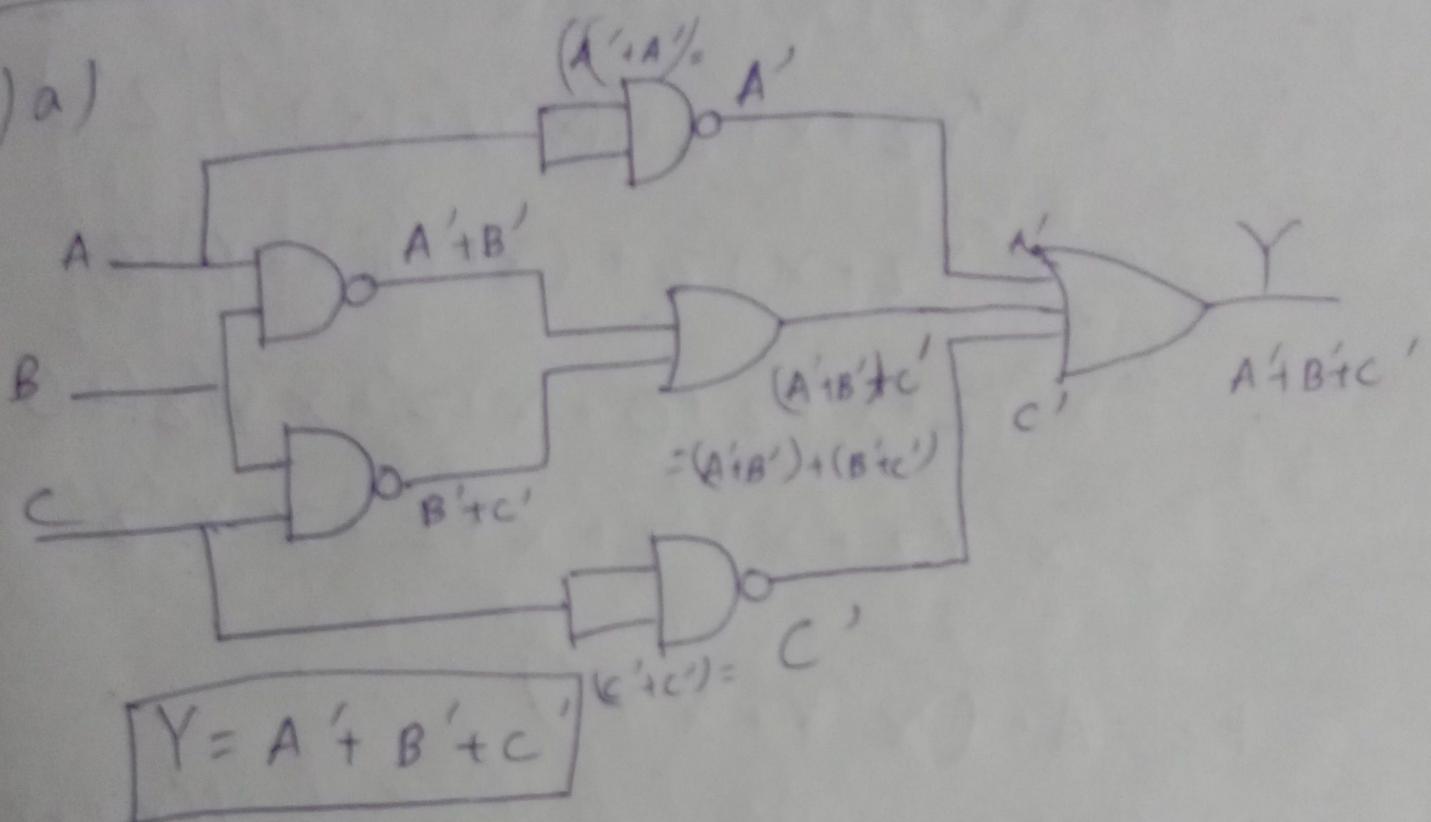
$$F' = AC'$$

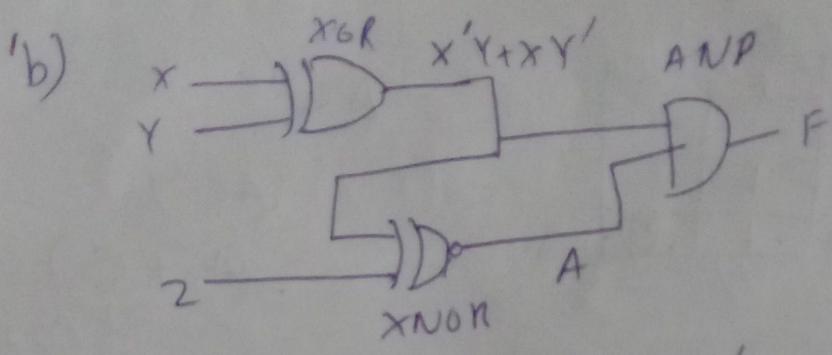
$$F = (F')' = (AC')'$$

$$= (A' + C)$$

$\Rightarrow POS$

4) a)

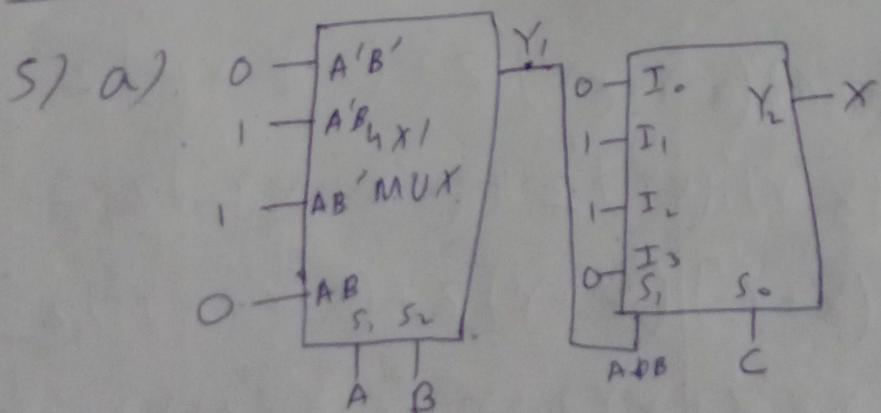




$$\begin{aligned}
 A &= (X'Y + XY')Z + (X'Y + XY')Z' \\
 &= X'YZ + XY'Z + ((X'Y) \cdot (XY'))'Z' \\
 &= X'YZ + XY'Z + (X+Y)(X'+Y)Z' \\
 &= X'YZ + XY'Z + X'Y'Z + XY'Z
 \end{aligned}$$

$$\begin{aligned}
 F &= A \cdot (X'Y + XY') \\
 &= (X'YZ + XY'Z + X'Y'Z + XY'Z)'(X'Y + XY') \\
 &= X'YZ + 0 + 0 + XY'Z + 0 + 0 + 0
 \end{aligned}$$

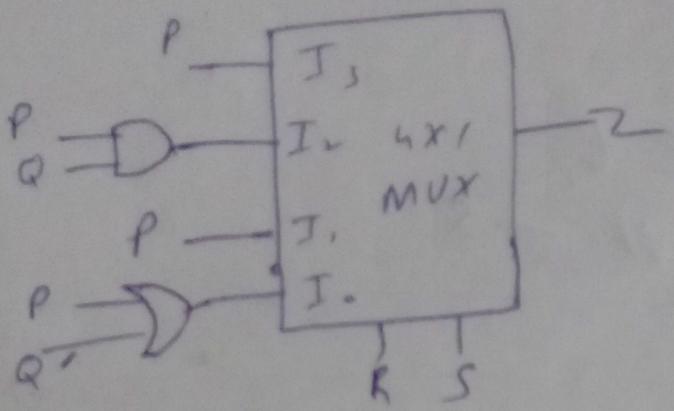
$$F = X'YZ + XY'Z$$



$$\begin{aligned}
 Y_1 &= 0 \cdot (A'B') + 1 \cdot (AB') + 1 \cdot (AB) + 0 \cdot (AB) \\
 &= A'B + AB' = A \oplus B
 \end{aligned}$$

$$\begin{aligned}
 X &= S_1'S_0 + S_1S_0' = (A \oplus B)'C + (A \oplus B)C' \\
 &= A \oplus B \oplus C \\
 &= AB'C' + A'BC' + A'B'C + ABC
 \end{aligned}$$

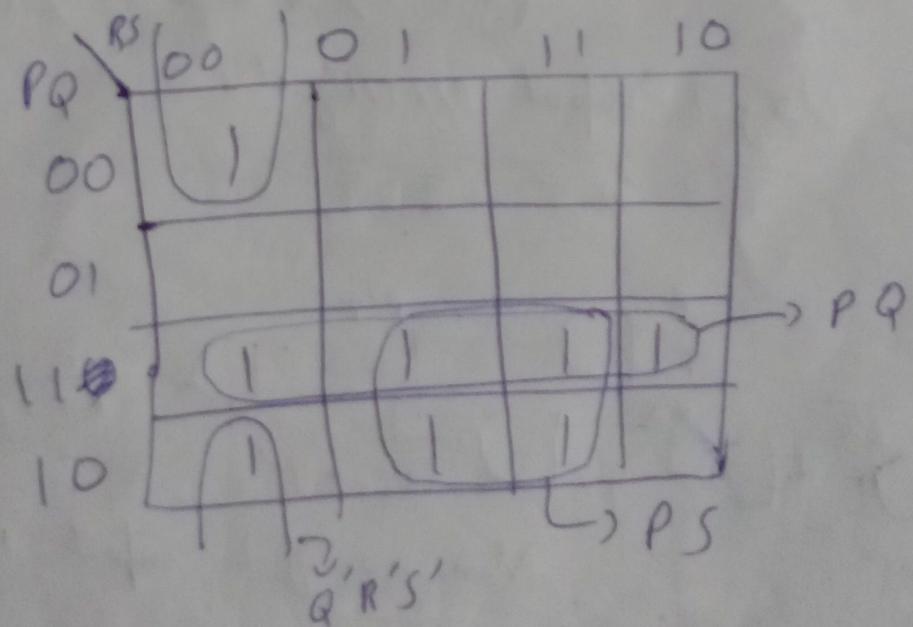
(b)



$$\begin{aligned}
 Z &= R'S'(P+Q') + R'S'P + RS'PQ + RSP \\
 &= R'S'P + R'S'Q' + \cancel{RSP} + \cancel{RS'PQ} + \cancel{RSP} \\
 &\cancel{=} \cancel{R'S'P} + \cancel{R'S'Q'} + \cancel{RS'PQ} + \cancel{RSP} \\
 &\text{or} \\
 &\cancel{R'S'P} + \cancel{R'S'Q'} + \cancel{SP} + \cancel{RS'PQ}
 \end{aligned}$$

$$Z = PRS + PQRS' + PR'S + PR'S' + Q'R'S$$

Using K-maps



$$Z = PQ + PS + Q'R'S'$$