Chapter-6

Combinational logic Design :-

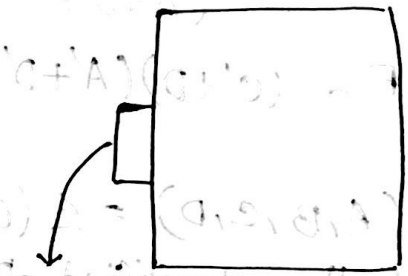
- Analysis
- Design

Steps of Design :-

1. Problem statement
2. Truth Table
3. K-map
4. Logic Diagram

Step-1:

A B C D	X
0 0 0 0	0
0 0 0 1	0
0 0 1 0	0
0 0 1 1	0
0 1 0 0	0
0 1 0 1	0
0 1 1 0	0
0 1 1 1	1
1 0 0 0	1
1 0 0 1	1
1 0 1 0	1
1 0 1 1	1
1 1 0 0	1
1 1 0 1	1
1 1 1 0	1
1 1 1 1	1



Output
X
Door open: 1
Door close: 0

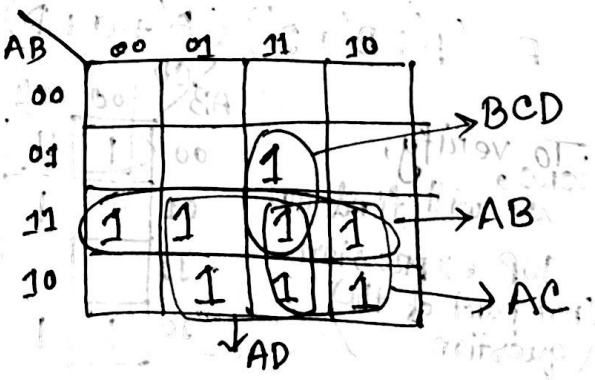
Absent: 0
Present: 1

□ Conditions: (to open door)

(1) If A is absent,
B, C, D should be present

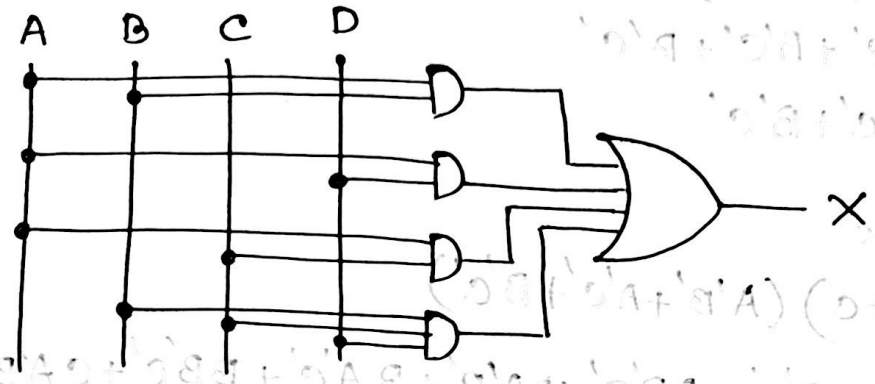
(2) If A is present,
B, C, D এর atleast একজনকে present থাকতে হবে

Step-2:



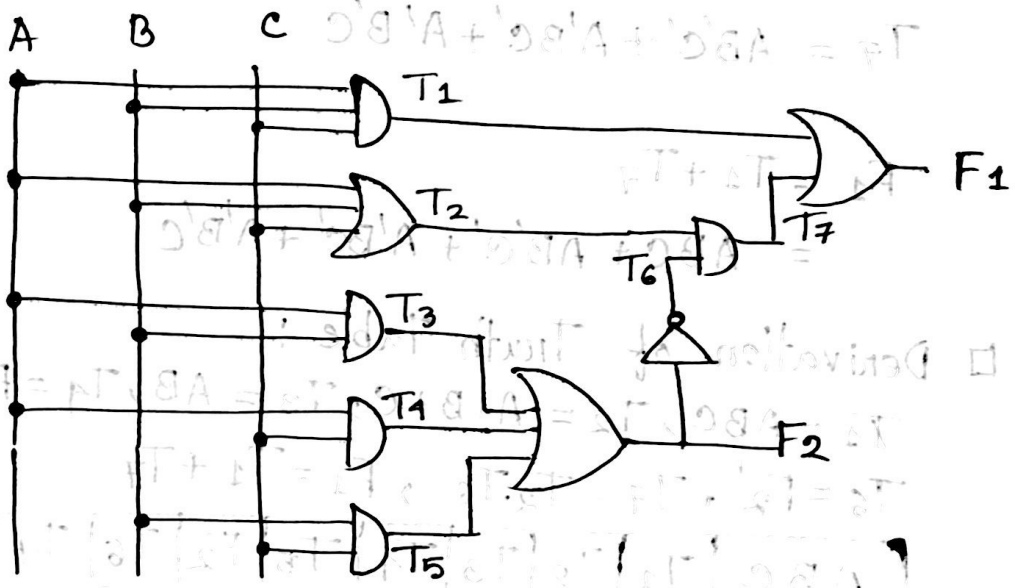
$X = AB + AD + AC + BCD$

Step-3: Logic Diagram:-



☐ Analysis of combinational Circuits:- (Design এর উল্টা)

Analysis:



Method-1: Derivation of Boolean Expressions:-

$T_1 = ABC$

$T_2 = A+B+C$

$T_3 = AB$

$T_4 = AC$

$T_5 = BC$

$F_2 = T_3 + T_4 + T_5$

$F_2 = AB + AC + BC$

$T_6 = F_2'$

$= (AB+AC+BC)'$

$= (AB)'.(AC)'.(BC)'$

$= (A'+B')(A'+C')(B'+C')$

$= (A' + A'C' + A'B' + B'C')(B'+C')$

$= (A'(1+C'+B') + B'C')(B'+C')$

* কোনো gate এর output থেকে অন্য gate এর input এ গেলে তাকে wire ধরবে

$= (A' + B'C')(B' + C')$

$= A'B' + A'C' + B'C' + B'C'$

$T_6 = A'B' + A'C' + B'C'$

$T_7 = T_2 . T_6$

$= (A + B + C)(A'B' + A'C' + B'C')$

$= \underset{0}{AA'B'} + \underset{0}{AA'C'} + AB'C' + \underset{0}{BA'B'} + BA'C' + \underset{0}{BB'C'} + CA'B' + \underset{0}{CA'C'} + \underset{0}{CB'C'}$

$= AB'C' + A'BC' + A'B'C$

$T_7 = AB'C' + A'BC' + A'B'C$

$F_1 = T_1 + T_7$

$= ABC + AB'C' + A'BC' + A'B'C$

□ Derivation of Truth Table :

$T_1 = ABC$, $T_2 = A + B + C$, $T_3 = AB$, $T_4 = AC$, $T_5 = BC$

$T_6 = F_2'$, $T_7 = T_2 . T_6$, $F_1 = T_1 + T_7$

ABC	T_1	T_2	T_3	T_4	T_5	F_2	T_6	T_7	F_1
000	0	0	0	0	0	0	1	0	0
001	0	1	0	0	0	0	1	1	1
010	0	1	0	0	0	0	1	1	1
011	0	1	0	0	1	1	0	0	0
100	0	1	0	0	0	0	1	1	1
101	0	1	0	1	0	1	0	0	0
110	0	1	1	0	0	1	0	0	0
111	1	1	1	1	1	1	0	0	1

Quiz - Chapter 3, Analysis