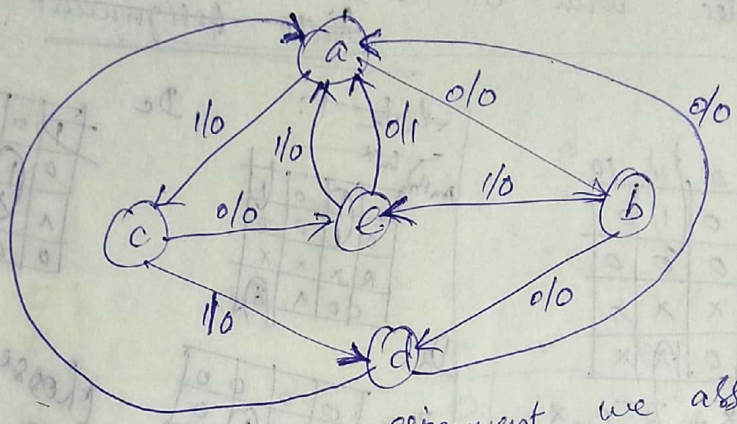
State Assignment Problem.

Design a seq. ckt. for a state diagram, Use state assignment rules for assigning states and compare the seq. combinational circuit with random state assignment.



Using random state assignment we assign,

a = 000, b = 001, c = 010, d = 011 & e = 100.

Excitation Table

Present state			Input	Next state			Output
A_n	B_n	C_n	X	A_{n+1}	B_{n+1}	C_{n+1}	Z
0	0	0	0	0	0	1	0
0	0	0	1	0	1	0	0
0	0	1	0	0	1	1	0
0	0	1	1	1	0	0	0
0	0	0	0	1	0	0	0
0	0	0	1	0	1	1	0
0	0	1	0	0	1	0	0
0	0	1	1	0	0	0	1
0	1	1	0	0	0	0	1
0	1	1	1	0	0	0	0
0	1	0	0	0	0	0	0
0	1	0	1	x	x	x	x
1	0	0	0	x	x	x	x
1	0	0	1	x	x	x	x
1	0	1	0	x	x	x	x
1	0	1	1	x	x	x	x
1	0	0	0	x	x	x	x
1	0	0	1	x	x	x	x
1	1	0	0	x	x	x	x
1	1	0	1	x	x	x	x
1	1	1	0	x	x	x	x
1	1	1	1	x	x	x	x

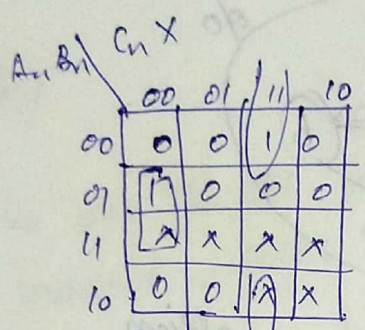
The random assignments require:

7 three i/p AND fns.
1 two i/p AND fn.
4 two i/p OR fns.

12 gates with 31 i/ps.

~~State Assignment~~

K-map



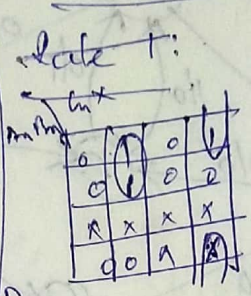
$D_A = B_n \bar{C}_n \bar{X} + \bar{B}_n C_n X$,

$D_B = \bar{A}_n \bar{C}_n X + \bar{B}_n C_n \bar{X}$

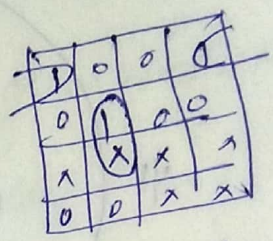
$D_C = \bar{A}_n \bar{B}_n \bar{X} + B_n \bar{C}_n X$,

$Z = B_n C_n X + A_n \bar{X}$.

Rule 1:

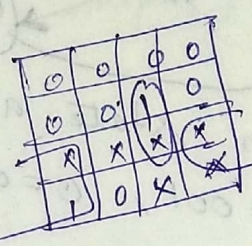


D_C



$D_B =$

$Z =$



Choose a FFs, (3 FFs)

Proper State Assignment

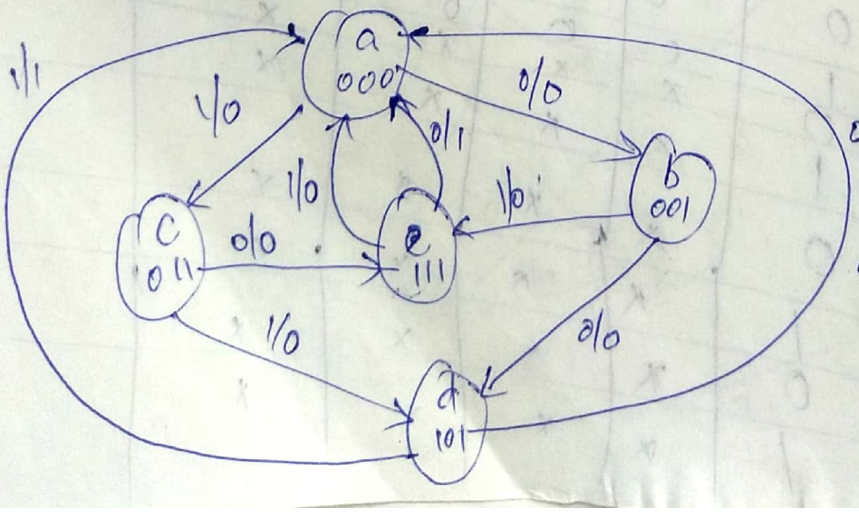
State Assignments rules and compare the results.

Rule 1: e & d must be adjacent, and ~~base~~ same next state (a).

b & c " " " (e, d) next state.

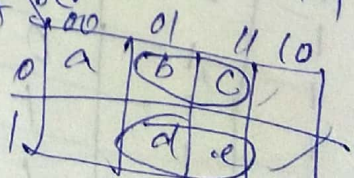
Rule 2: b & c " " adjacent,

e & d must be adjacent.



replaced by alphabets

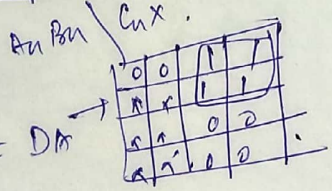
State diag. after applying rules 1 & 2.



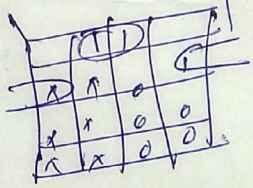
K-map showing d-c, d-e adjacent to each other (b+d) (c⊕e)

Pr. state A_n	B_n	C_n	Input x	Next state A_{n+1}	B_{n+1}	C_{n+1}	Output z
0	0	0	0	0	0	1	0
0	0	0	1	0	1	1	0
0	0	1	0	1	0	1	0
0	0	1	1	1	1	1	0
0	1	0	0	x	x	x	x
0	1	0	1	x	x	x	x
0	1	1	0	1	1	1	x
0	1	1	1	1	0	1	0
1	0	0	0	x	x	x	0
1	0	0	1	x	x	x	x
1	0	1	0	0	0	0	0
1	0	1	1	0	0	0	1
1	1	0	0	x	x	x	x
1	1	0	1	x	x	x	x
1	1	1	0	0	0	0	1
1	1	1	1	0	0	0	x

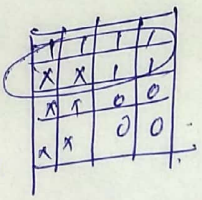
K-map



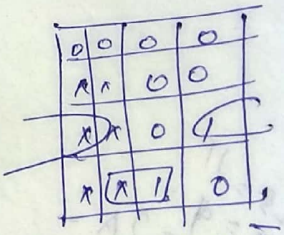
$A_{n+1} = D_A = \bar{A}_n C_n + A_n B_n x + A_n \bar{B}_n \bar{x}$



$B_{n+1} = D_B = \bar{A}_n B_n x + A_n \bar{B}_n x + \bar{A}_n B_n \bar{x}$



$C_{n+1} = D_C = \bar{A}_n \bar{x} + A_n \bar{B}_n x$



$Z = A_n B_n \bar{x} + A_n \bar{B}_n x$

the state assignments using Rule 1 & 2 require..

4	three	i/p AND gns.
1	two	i/p AND gns.
2	Two	i/p OR gns.

7 gates with 18 i/ps.

Rule 1 & 2 good results have been achieved.