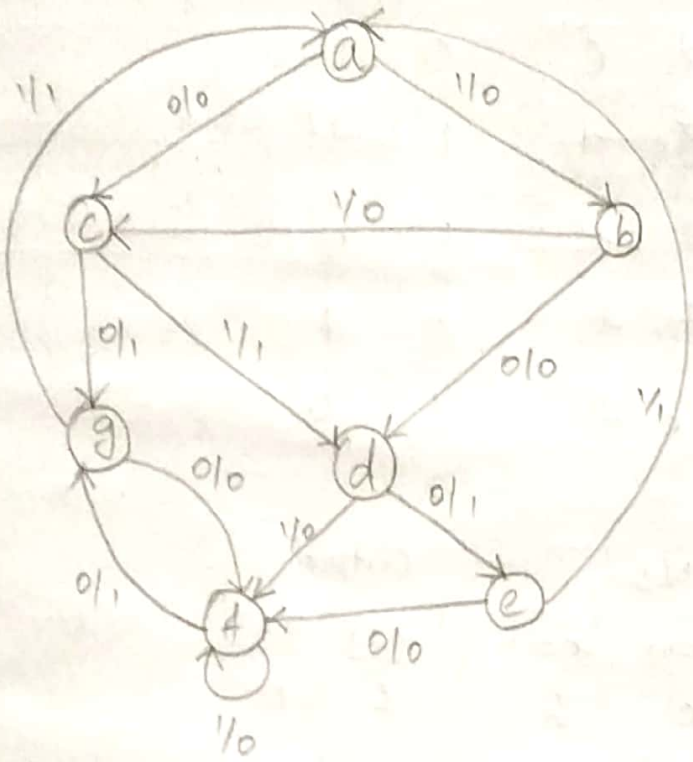
Analysis & Design of clocked Sequential Circuit.

1.) Design a clocked sequential circuit using D Flip Flop for the diagram



Solu:

Let x be the input Z be the output

State table

Ps	NS		Output	
	x=0	x=1	x=0	x=1
a	c	b	0	0
b	d	c	0	0
c	g	d	1	1
d	e	f	1	0
e	f	a	0	1
f	g	f	1	0
g	f	a	0	1

Equivalent States

PS	NS		Output	
	x=0	x=1	x=0	x=1
a	c	b	0	0
b	d	c	0	0
c	~~g~~e	d	1	1
d	e	~~f~~	1	0
e	~~f~~	a	0	1
~~f~~	~~g~~e	~~f~~	1	0

PS	NS		Output	
	x=0	x=1	x=0	x=1
a	c	b	0	0
b	d	c	0	0
c	e	d	1	1
d	e	~~f~~d	1	0
e	~~f~~d	a	0	1

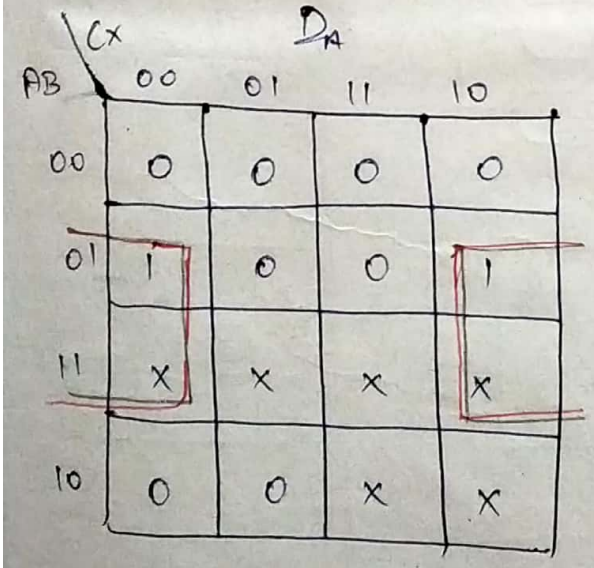
No. of bits required to assign each state must contain 3 bit ($2^3 \geq 5$)

∴ Assign a=000 b=001 c=010 d=011 e=100

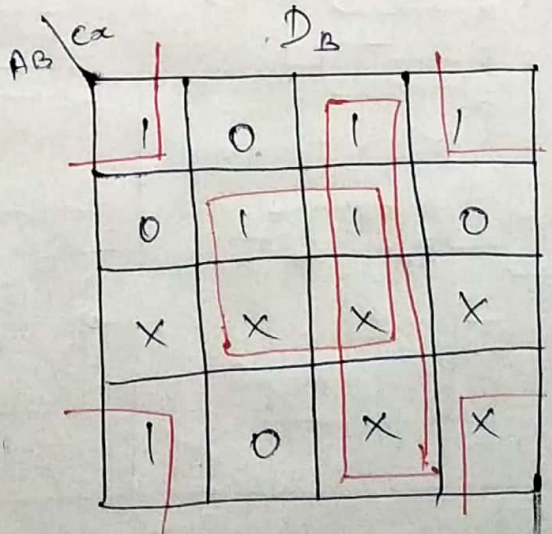
Use D Flip Flop excitation table.

A	A^+	D_A
0	0	0
0	1	1
1	0	0
1	1	1

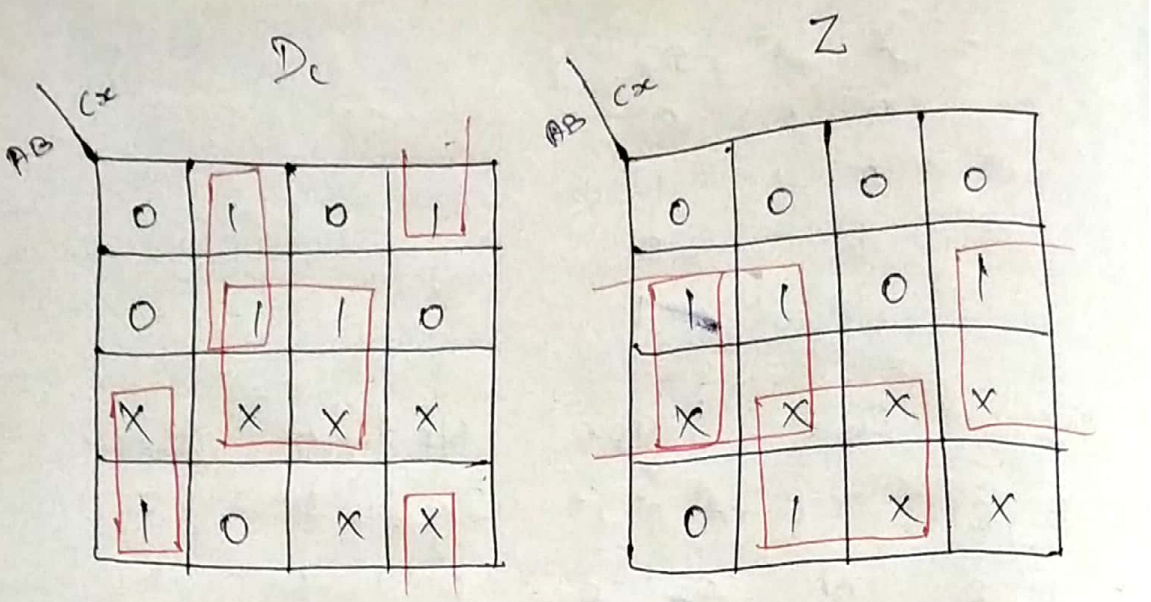
PS			Input	NS			F/F inputs.			Output
A	B	C	x	A^+	B^+	C^+	D_A	D_B	D_C	Z
0	0	0	0	0	1	0	0	1	0	0
0	0	0	1	0	0	1	0	0	1	0
0	0	1	0	0	1	1	0	1	1	0
0	0	1	1	0	1	0	0	1	0	0
0	1	0	0	1	0	0	1	0	0	1
0	1	0	1	0	1	1	0	1	1	1
0	1	1	0	1	0	0	1	0	0	1
0	1	1	1	0	1	1	0	1	1	0
1	0	0	0	0	1	1	0	1	1	0
1	0	0	1	0	0	0	0	0	0	1



$D_A = B\bar{x}$



$D_B = Bx + Cx + \bar{B}\bar{x}$



$D_C = A\bar{C}\bar{x} + Bx + \bar{A}\bar{C}x + \bar{B}C\bar{x}$

$Z = Ax + B\bar{x} + B\bar{C}$