

part - A.  
① JK to D:

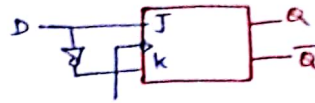
D	a	a(t+1)	J	K
0	0	0	0	X
0	1	0	X	1
1	0	1	1	X
1	1	1	X	0

J	$\bar{a}$	a
0	0	X
1	0	X

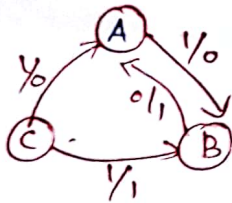
J = D

$\bar{a}$	a
0	X
1	0

K =  $\bar{D}$



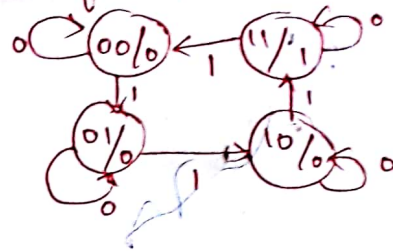
② Mealy.



⇒ o/p depends on both present state & i/p 2 o/p as well as past i/p

Moore:

o/p is a func of present state



③ Sipo & piso.

④ critical & non-critical race

⑤.  $\bar{A}\bar{B}$   $\bar{A}B$   $AB$   $AB$

0	1	0	1
1	0	1	0
0	0	0	0
1	1	1	1

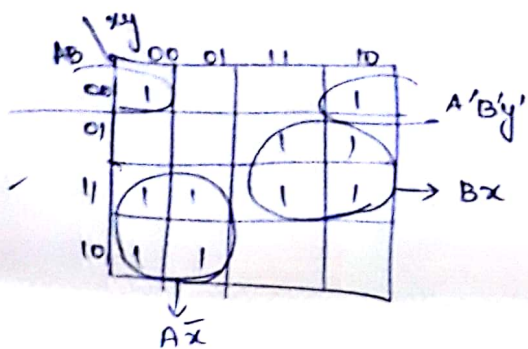
$\bar{A}\bar{C}\bar{D}$  → hazard free

=  $\bar{A}\bar{C}\bar{D} + \bar{B}\bar{D} + \bar{A}BC$  → with hazard. ⇒ + chkt

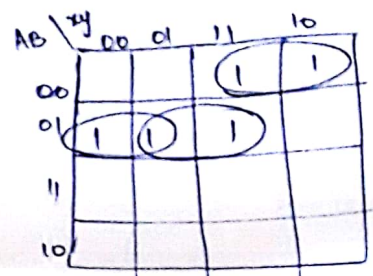
part - B

6 a).

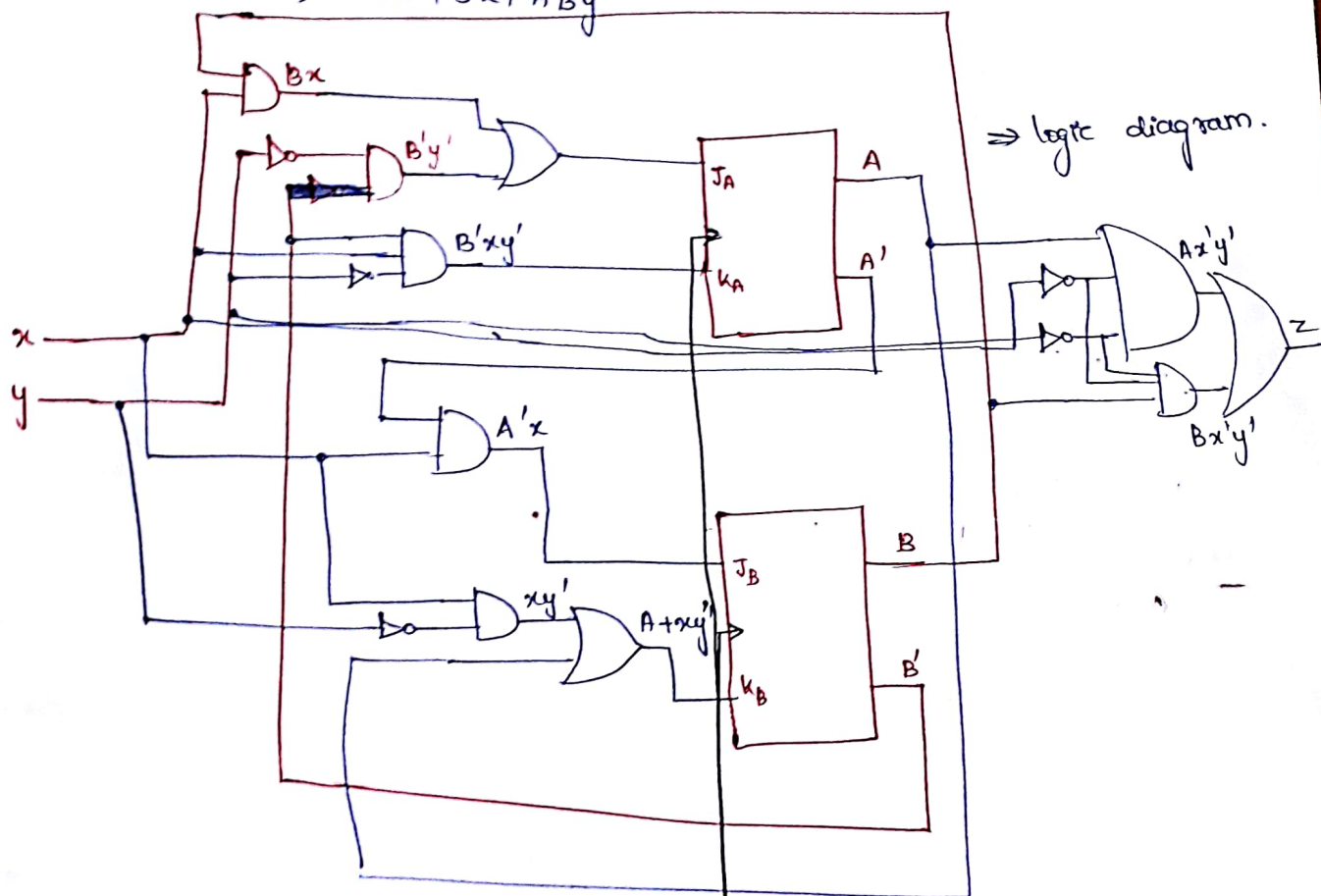
present state	i/p	Next-state	o/p	FF o/p
A B	x y	A B	z	J <sub>A</sub> K <sub>A</sub> J <sub>B</sub> K <sub>B</sub>
0 0	0 0	1 0	0	1 0 0 0
0 0	0 1	0 0	0	0 0 0 0
0 0	1 0	1 1	0	1 1 1 1
0 0	1 1	0 1	0	0 0 1 0
0 1	0 0	0 1	1	0 0 0 0
0 1	0 1	0 1	0	0 0 0 0
0 1	1 0	1 0	0	1 0 1 0
0 1	1 1	1 1	0	1 0 1 0
1 0	0 0	1 0	0	1 0 0 1
1 0	0 1	1 0	0	0 0 0 1
1 0	1 0	0 0	0	1 1 0 1
1 0	1 1	1 0	0	0 0 0 1
1 1	0 0	1 0	1	0 0 0 1
1 1	0 1	1 0	0	0 0 0 1
1 1	1 0	1 0	0	1 0 0 1
1 1	1 1	1 0	1	1 0 0 1



$$A(t+1) = A\bar{x} + Bx + A'B'y'$$



$$B(t+1) = A'B'x + A'B'(x+y)$$



State equn:-

$$J_A = Bx + B'y'$$

$$K_A = B'xy'$$

Char. equn  $Q(t+1) = J\bar{Q} + KQ$

$$A(t+1) = J_A \bar{A} + K_A A$$

$$A(t+1) = (Bx + B'y')\bar{A} + (B'xy')'A$$

$$= Bx\bar{A} + \bar{B}\bar{y}\bar{A} + A\bar{B}x + A\bar{B}\bar{y} + Axy$$

↳ ①

$$B(t+1) = J_B \bar{B} + K_B B$$

$$= (A'x)\bar{B} + (A+xy)B$$

$$= \bar{A}\bar{B}x + \bar{A}(x+y)B$$

$$= \bar{A}\bar{B}x + \bar{A}(\bar{x}+y)B = \bar{A}\bar{B}x + \bar{A}\bar{B}\bar{x} + \bar{A}By$$

$$B(t+1) = \bar{A}(B \oplus x) + \bar{A}By \rightarrow ②$$



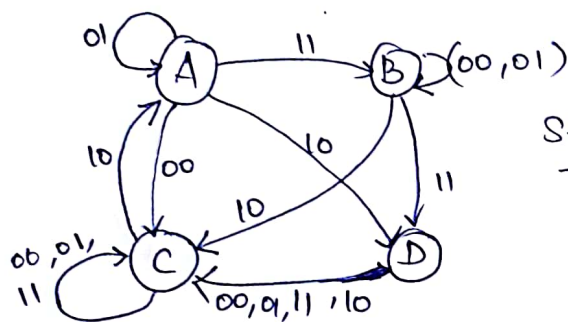
③

A	B	x	y	A(t+1)	B(t+1)	z
0	0	0	0	1	0	0
0	0	0	1	0	0	0
0	0	1	0	1	1	0
0	0	1	1	0	1	0
0	1	0	0	0	1	1
0	1	0	1	0	1	0
0	1	1	0	1	0	0
0	1	1	1	1	1	0
1	0	0	0	1	0	0
1	0	0	1	1	0	0
1	0	1	0	0	0	0
1	0	1	1	1	0	0
1	1	0	0	1	0	1
1	1	0	1	1	0	0
1	1	1	0	1	0	0
1	1	1	1	1	0	1

present state	Next state				o/p (z)			
zy (i/p)	00	01	10	11	00	01	10	11
00	10	00	11	01	0	0	0	0
01	01	01	10	11	1	0	0	0
10	10	10	00	10	0	0	0	0
11	10	10	10	10	1	0	0	1

State Assignment

pres. st	Next state				o/p (z)			
	00	01	10	11	00	01	10	11
A 00	C	A	D	B	0	0	0	0
B 01	B	B	C	D	1	0	0	0
C 10	C	C	A	C	0	0	0	0
D 11	C	C	C	C	1	0	0	1



State Diagram

b) present state Next state

QA QB QC	QA(t) QB(t) QC(t)
0 0 0 0	0 0 1
1 0 0 1	0 1 1
2 0 1 0	0 0 0
3 0 1 1	1 1 1
4 0 0 0	0 0 0
5 1 0 1	0 0 0
6 1 1 0	1 0 0
7 1 1 1	1 1 0

FF o/p

JA KB	JB KB	Jc Kc
0 X	0 X	1 X
0 X	1 X	X 0
0 X	X 1	0 X
1 X	X 0	X 0
X 1	0 X	0 X
X 1	0 X	X 1
X 0	X 1	0 X
X 0	X 0	X 1

$$J_A = (3) + \Sigma d(4, 5, 6, 7)$$

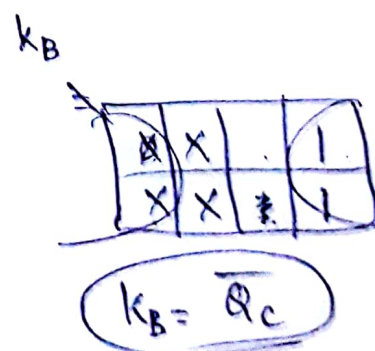
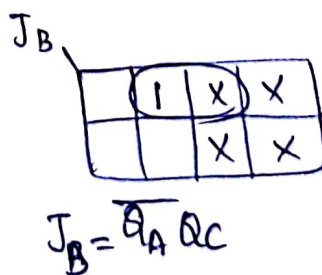
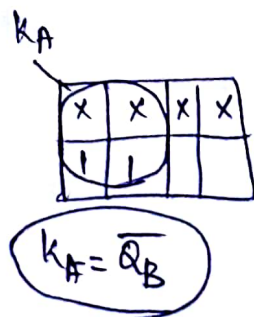
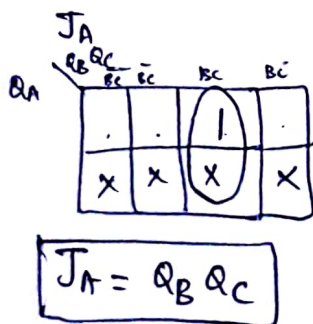
$$K_A = (4, 5) + \Sigma d(0, 1, 2, 3)$$

$$J_B = (1) + \Sigma d(2, 3, 6, 7)$$

$$K_B = (2, 6), \Sigma d(0, 1, 4, 5)$$

$$J_C = (0) + \Sigma d(1, 3, 5, 7)$$

$$K_C = (5, 7) + \Sigma d(0, 2, 4, 6)$$



Jc

$\bar{B}\bar{C}$	$B\bar{C}$		
1	x		x
	x	x	

$$J_c = \bar{Q}_B \bar{Q}_A$$

Kc

x			x
x	1	1	x

$$K_c = Q_A$$

(A)

$J_A$	$Q_A$
$K_A$	$\bar{Q}_A$

$J_B$	$Q_B$
$K_B$	$\bar{Q}_B$

$J_C$	$Q_C$
$K_C$	$\bar{Q}_C$

$$J_A = Q_B Q_C$$

$$K_A = \bar{Q}_B$$

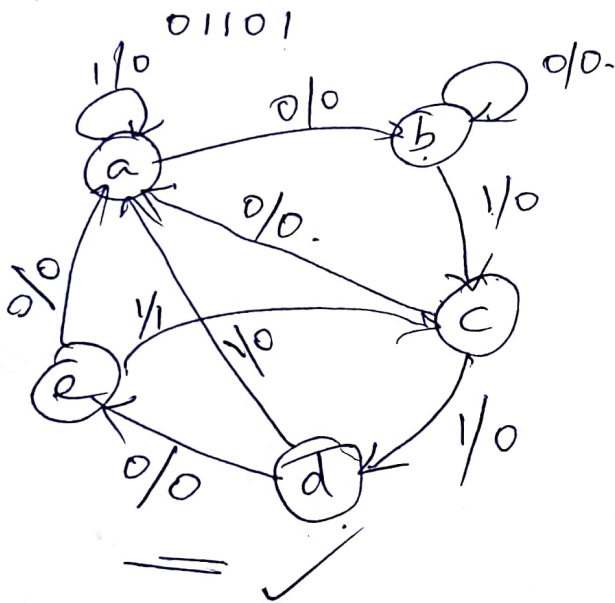
$$J_B = \bar{Q}_A Q_C$$

$$K_B = \bar{Q}_C$$

$$J_C = \bar{Q}_A \bar{Q}_B$$

$$K_C = Q_A$$

7 q.



0110110111  
11

7. b).  $i/p \rightarrow x_1, x_2$  &  $o/p \rightarrow z$

initial  $x_1, x_2 = 0$

$x_1(0) \text{ or } x_2 = 1 \rightarrow o/p \rightarrow 1$

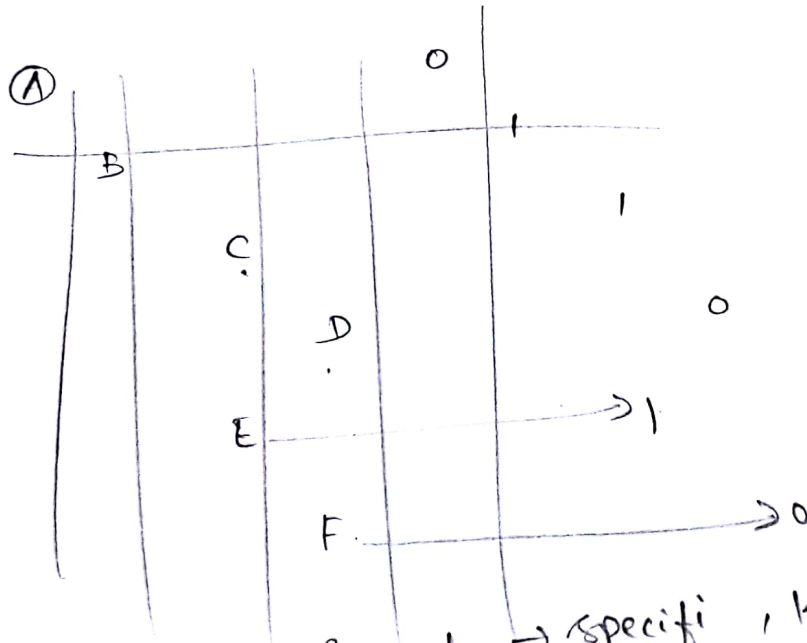
also,  $x_2 = 1 \rightarrow o/p \rightarrow 0$

until initial state  $\rightarrow o/p \rightarrow 0$

(5)

A | (A)

	00	01	10	11		00	01	10	11
00 (A)	(A)	B	C	D	-	0	-	-	-
01 B	A	(B)	C	D	-	0	1	-	-
10 C	A	-	(C)	D	-	0	0	1	-
11 D	A	B	C	(D)	-	-	-	-	0



2 states reduce,  $i/p, o/p \rightarrow$  specifici, k-map, ckt diagram

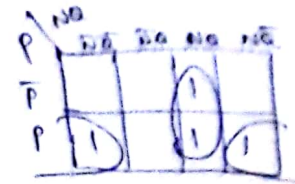
part - c

(b)

8 a).

P	N	Q(t+1)
0	0	0
0	1	Q(t)
1	0	Q'(t)
1	1	1

P	N	Q(t)	Q(t+1)
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1

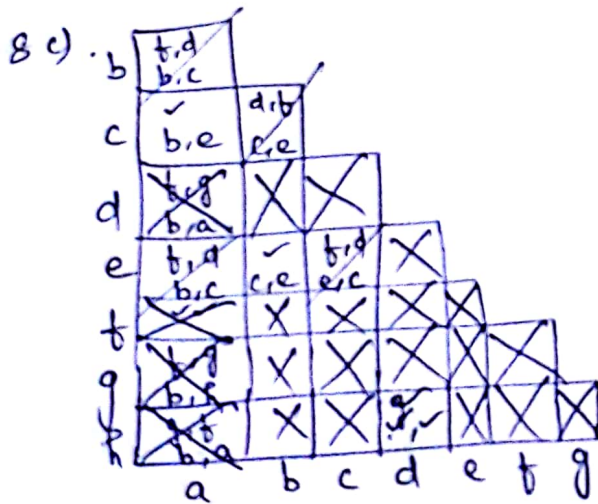


$$Q(t+1) = PQ' + NQ$$

Excitation Table :-

Q(t)	Q(t+1)	P	N
0	0	0	X
0	1	1	X
1	0	X	0
1	1	X	1

8 b).



$$A \neq B \neq C \neq E$$

$$A = B = E \quad B = C = E$$

$$D = H$$

present state	Next state		o/p	
	x=0	x=1	x=0	x=1
a	f	a	0	0
d	g	a	1	0
f	f	a	1	1
g	g	d	0	1