18ECE206J - Answerkey | Set C

Advanced digital System design | CT1 - C

PART-A (5×1 = 5 Marks) (Answer all)

1. (B) Shannon
2. (C) (A+C+D)
3. (b) 5
4. (b) Z=0
5. (b) State diagram.

PART-B (2×10 = 20 Marks)

(Answer any two)

6. (i) $f(w,x,y) = wx + \bar{w}y + \bar{x}\bar{y}$

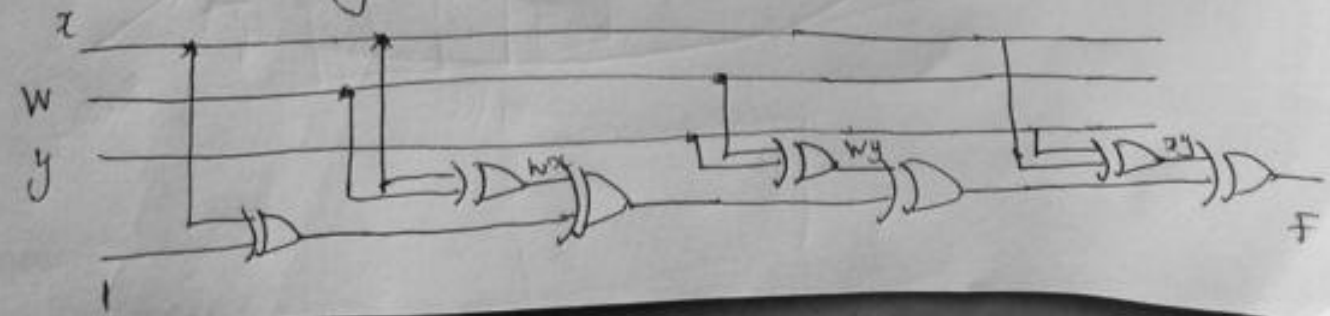
$= wx \oplus (1 \oplus w)y \oplus (1 \oplus x)(1 \oplus y)$

$= wx \oplus y \oplus wy \oplus 1 \oplus x \oplus y \oplus xy$

$= 1 \oplus x \oplus \underbrace{y \oplus y}_{0} \oplus wx \oplus wy \oplus xy$

$= 1 \oplus x \oplus wx \oplus wy \oplus xy$ (3m)

Logic diagram (2m)



(ii) $F(A,B,C) = \bar{A}\bar{C} + AB + AC$

Using 4:1 Mux.

$= \bar{A}\bar{B}(\bar{C}+0+0) + \bar{A}B(\bar{C}+0+0)$

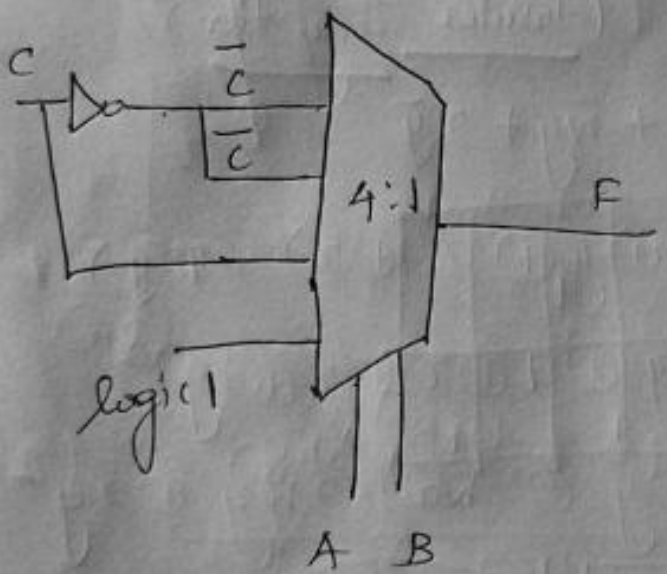
$+ A\bar{B}(0+0+C) + AB(0+1+C)$

$1+C=1$

$= \bar{A}\bar{B}(\bar{C}) + \bar{A}B(\bar{C}) + \bar{A}\bar{B}(C) + AB(1)$

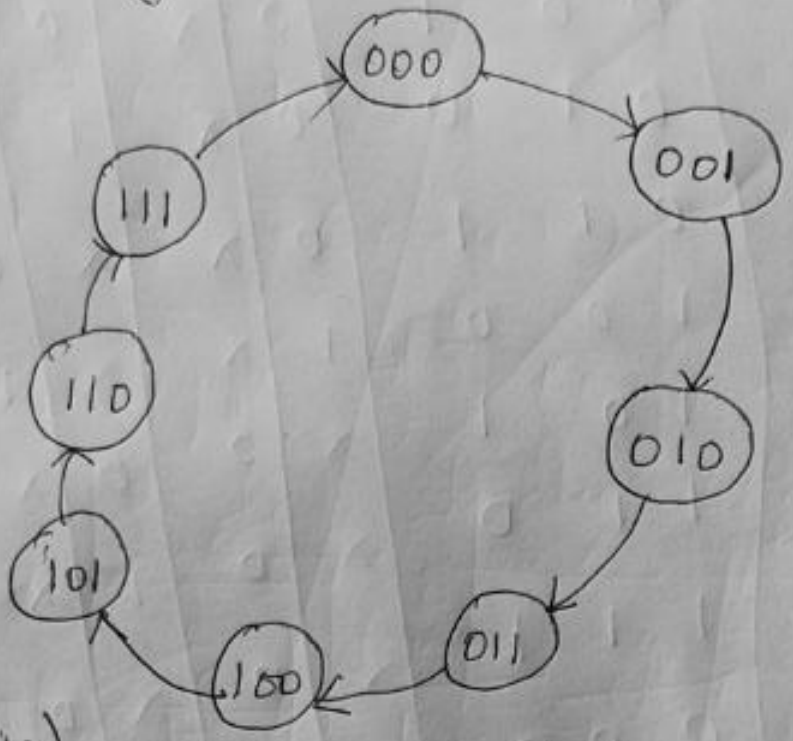
(3m)

Logic function (2m)



(7) Design 3-bit Synchronous up Counter.

Step1 State diagram: (1m)



Step2 (1m)

State table:

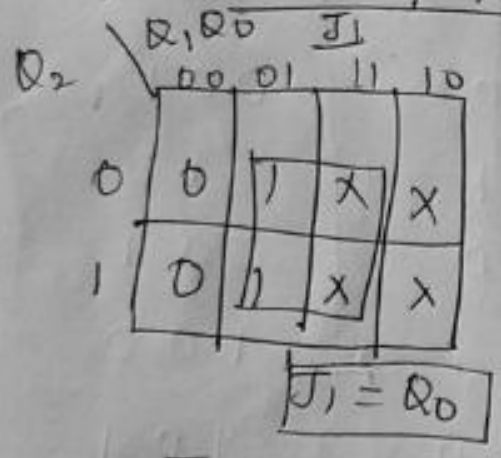
Present State	Next State
000	001
001	010
010	011
011	100
100	101
101	110
110	111
111	000

Step 3

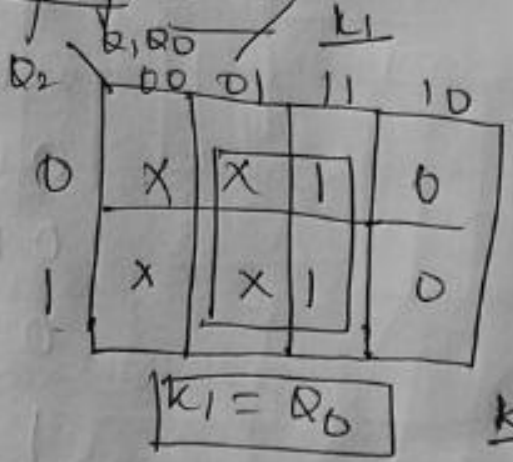
Excitation table for counter (3 m)

Present State			Next State			Flip flop Inputs					
Q_2	Q_1	Q_0	Q_2^*	Q_1^*	Q_0^*	J_2	k_2	J_1	k_1	J_0	k_0
0	0	0	0	0	1	0	x	0	x	1	x
0	0	1	0	1	0	0	x	1	x	x	1
0	1	0	0	1	1	0	x	x	0	1	x
0	1	1	1	0	0	1	x	x	1	x	1
1	0	0	1	0	1	x	0	0	x	1	x
1	0	1	1	1	0	x	0	1	x	x	1
1	1	0	1	1	1	x	0	x	0	1	x
1	1	1	0	0	0	x	1	x	1	x	1

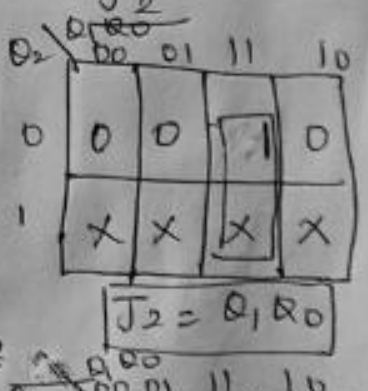
Step 4 k-map simplification



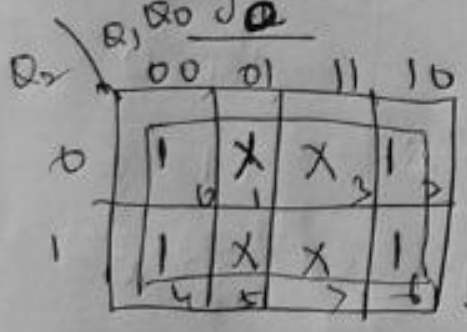
$J_1 = Q_0$



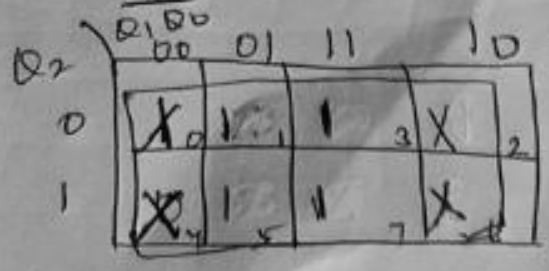
$K_1 = Q_0$



$J_2 = Q_1Q_0$



$J_0 = 1$



$K_0 = 1$

$K_2 = Q_1Q_0$

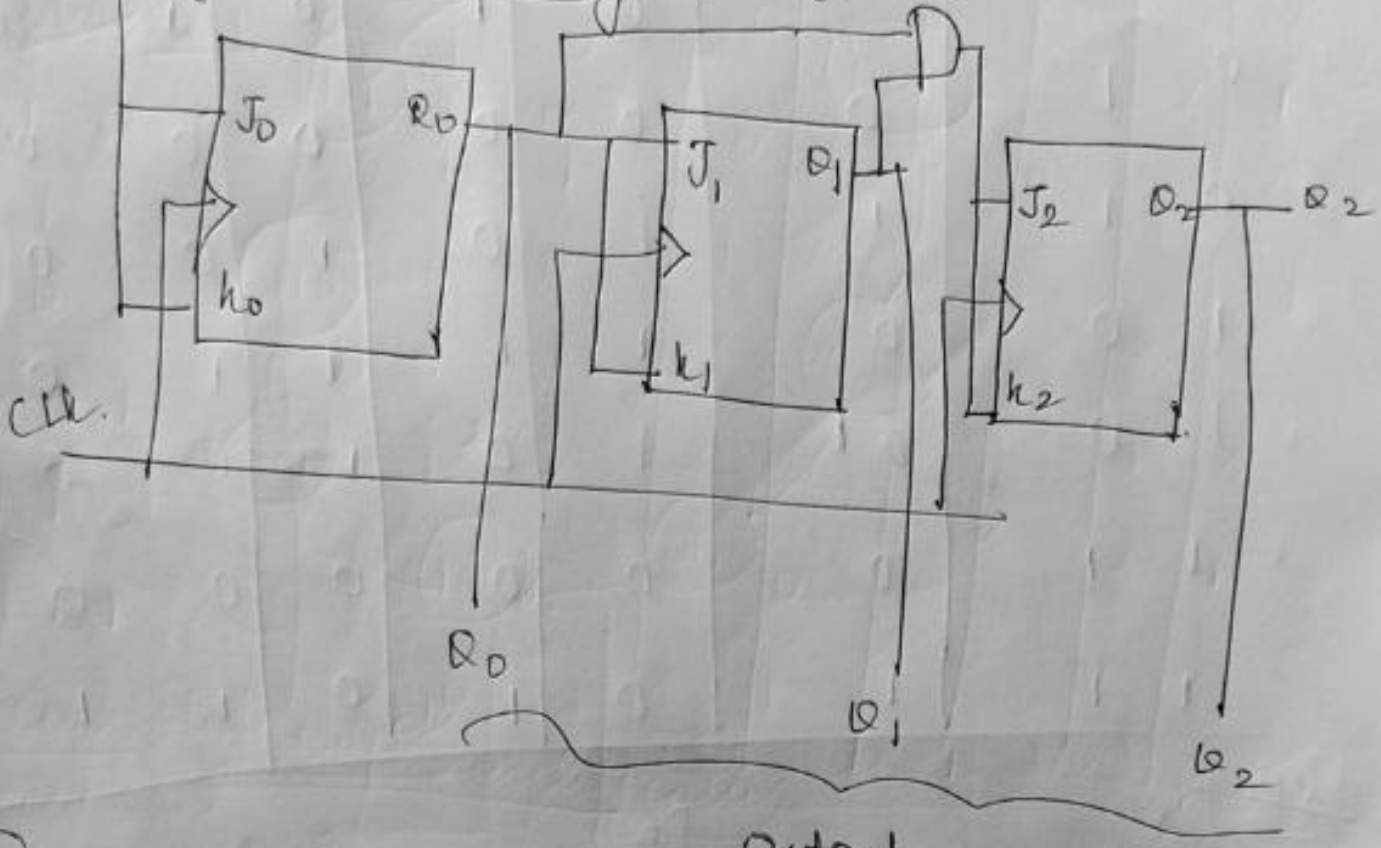
$J_0 = 1$ $K_0 = 1$

$J_1 = Q_0$ $K_1 = Q_0$

$J_2 = Q_0 Q_1$ $K_2 = Q_0 Q_1$

(3m)

Logic circuit diagram (2m)

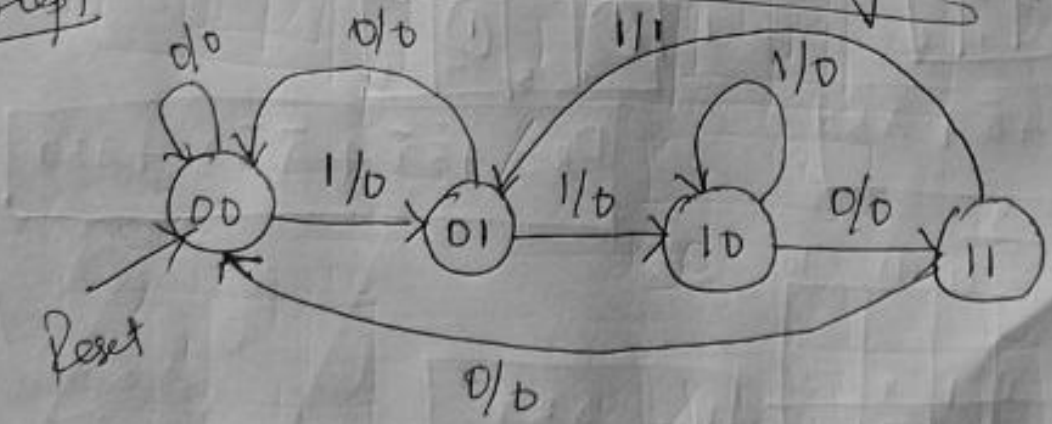


Output

(8)

1101 1 bit Overlapping (2 mark)

Step 1

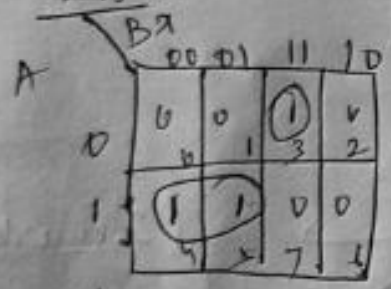


Step 2 (3m)

	Present State		Input	Next State		flipflop I/P		O/P
	A	B	x	$A_{(t+1)}$	$B_{(t+1)}$	D_A	D_B	y
0	0	0	0	0	0	0	0	0
1	0	0	1	0	1	0	1	0
2	0	1	0	0	0	0	0	0
3	0	1	1	1	0	1	0	0
4	1	0	0	1	1	1	1	0
5	1	0	1	1	0	1	0	0
6	1	1	0	0	0	0	0	0
7	1	1	1	0	1	0	1	1

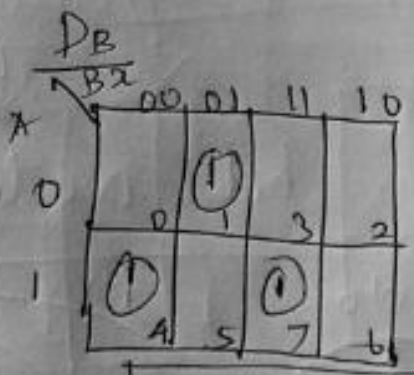
Step 3

D_A

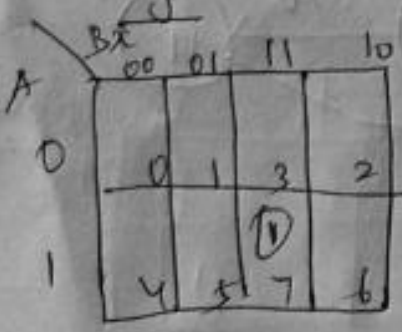


$D_A = A\bar{B} + \bar{A}Bx$

D_B



$D_B = A\bar{B}\bar{x} + \bar{A}\bar{B}x + ABx$



$y = ABx$

Circuit diagram (2m)

(3m)