Department of Electronics Engineering
National Chiao Tung University

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Logic design (2016 fall)

Quiz # 12

Name:_____ID:_____

Design a 3-bit counter counts in sequence : 001, 011, 010, 110, 111, 101, 100, (repeat) 001, ……

(a) (50%) Use D flip-flops.

cba	$c^+b^+a^+$
000	
001	
010	
011	
100	
101	
110	
111	

C^+

ba \ c	0	1
00		
01		
11		
10		

B^+

ba \ c	0	1
00		
01		
11		
10		

A^+

ba \ c	0	1
00		
01		
11		
10		

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(b) (50%) Use J-K flip-flops.

cba	$c^+b^+a^+$
000	
001	
010	
011	
100	
101	
110	
111	

C^+

ba \ c	0	1
00		
01		
11		
10		

B^+

ba \ c	0	1
00		
01		
11		
10		

A^+

ba \ c	0	1
00		
01		
11		
10		

J_c

ba \ c	0	1
00		
01		
11		
10		

K_c

ba \ c	0	1
00		
01		
11		
10		

J_B

ba \ c	0	1
00		
01		
11		
10		

K_B

ba \ c	0	1
00		
01		
11		
10		

J_A

ba \ c	0	1
00		
01		
11		
10		

K_A

ba \ c	0	1
00		
01		
11		
10		

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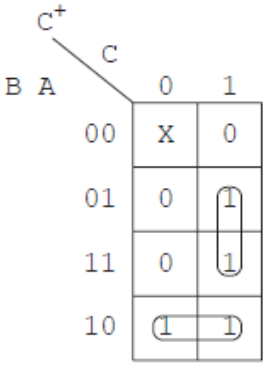
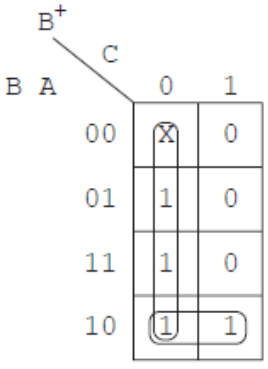
(a)

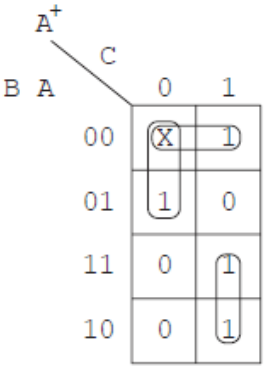
CBA	$C^+B^+A^+$
0 0 0	X X X
0 0 1	0 1 1
0 1 0	1 1 0
0 1 1	0 1 0
1 0 0	0 0 1
1 0 1	1 0 0
1 1 0	1 1 1
1 1 1	1 0 1



$C^+ = C\,A + B\,A'$



$B^+ = C' + B\,A'$



$A^+ = C'B' + C\,B + B'A'$

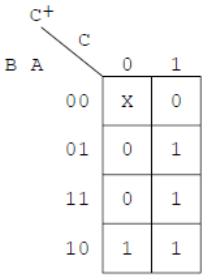
$A^+ = C'B' + C\,B + C\,A'$

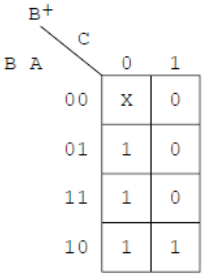
For D flip-flop: 000 goes to 011 because $D_C D_B D_A = 011$

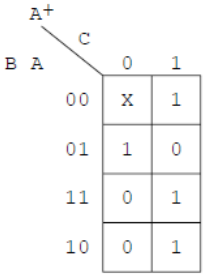
(b)

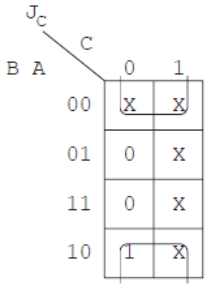
12.8 (a)

CBA	$C^+B^+A^+$
0 0 0	X X X
0 0 1	0 1 1
0 1 0	1 1 0
0 1 1	0 1 0
1 0 0	0 0 1
1 0 1	1 0 0
1 1 0	1 1 1
1 1 1	1 0 1

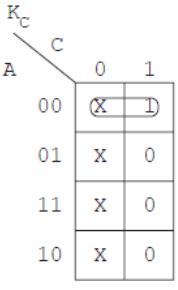




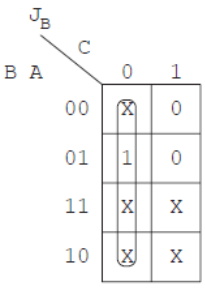




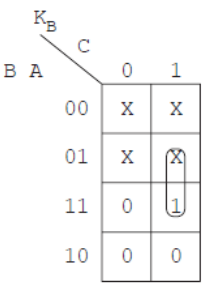
$J_C = A'$



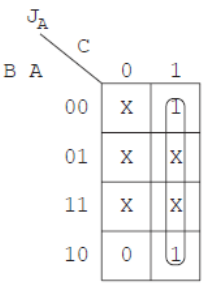
$K_C = B'A'$



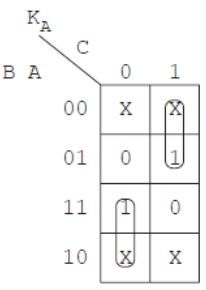
$J_B = C'$



$K_B = C\,A$



$J_A = C$



$K_A = C'B + C\,B'$