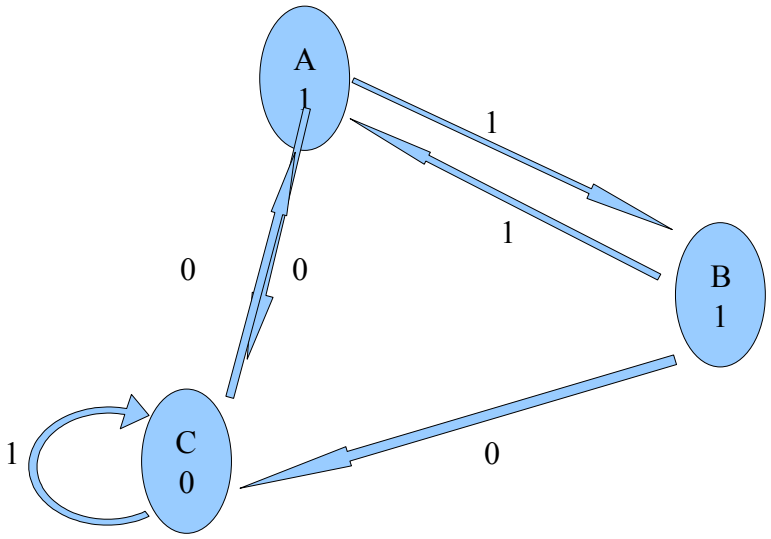
Homework 23 Solutions

Chapter 7, 2a (i)

Though not required to complete this problem, below is the state diagram



State Equations and Output Equation

$$D_A = Q_C X` + Q_B X$$

$$D_B = Q_A X$$

$$D_C = Q_A X` + Q_B X` + Q_C X \qquad Z = Q_A + Q_B$$

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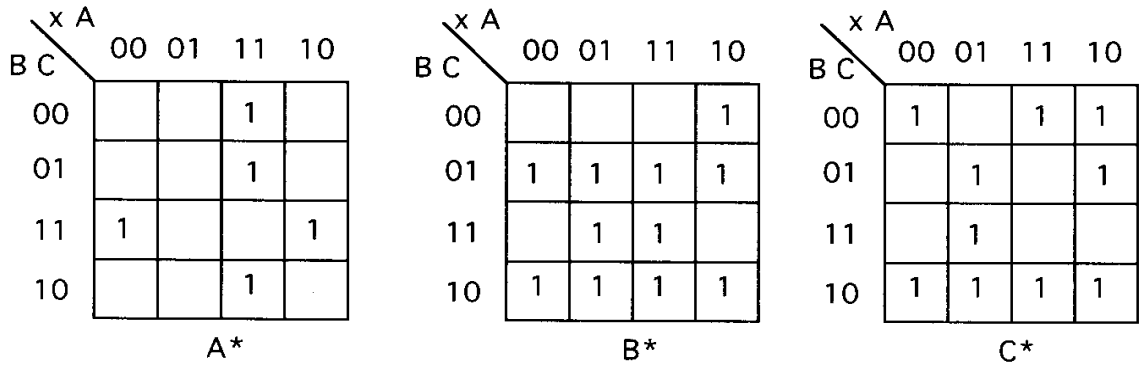
12. The state table for this counter follows

q	q * x = 0	x = 1
0	1	3
1	2	3
2	3	3
3	4	4
4	0	5
5	3	6
6	3	7
7	3	2

This produces the following maps



a. i. For the D flip flop, we have

$D_A = A' B C + x A B' + \underline{x A C'}$

$D_B = B' C + B C' + \underline{x A' B'} + \{A B \text{ or } A C\}$

$D_C = x' A C + \underline{x A' B'} + \underline{x A C'} + B C' + A' C'$

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d. All of the outputs come from flip flops. We can compute the inputs for a D flip flop for Q using

$$D = Q^* = J\,Q' + K\,Q$$

and then simplifying the algebra. The result is

$$D = A\,Q + B'\,Q + C'\,Q + x\,A'\,B' + x'\,A\,B + x'\,A\,C$$

we already found the D inputs for the other flip flops in part a.