1) Design a fully simplified 3 bit mod 6 up counter with your choice of T, JK, or D

3) Consider a system with 3 resources (A, B, C). The Banker's Algorithm is used to allocate resources and it has the following SAFE state:

Available: A B C
            1 2 2

Process	Allocation			Max			Need		
	A	B	C	A	B	C	A	B	C
P0	2	1	1	2	4	4	0	3	3
P1	1	1	2	2	4	4	1	3	2
P2	3	2	1	6	6	1	3	4	0
P3	0	1	0	0	3	2	0	2	2

The following 2 questions are independent. That is, assume that both begin with the same system data listed above.
a) If P1 requests an additional unit of resource B, will it be allowed? Justify your answer.
b) If P1 requests an additional unit of resource A, will it be allowed? Justify your answer.

CS 6901   Capstone Exam   Data Structures   Spring 2016:   Choose any 2 problems.

1. Write a boolean function that is given a binary tree and returns true if and only if the tree has an even number of nodes. An empty tree is considered to have an even number of nodes.
Notes:
  The function should have just one argument, a pointer to the root.
  No global variables may be used.
  No additional functions may be defined. You may not count the number of nodes.

2. Given the following two sorted arrays of integers:
      A[0]..A[n-1],
      B[0]..B[m-1].
Write an algorithm (using code) that merges the contents of A and B into a new sorted array of integers
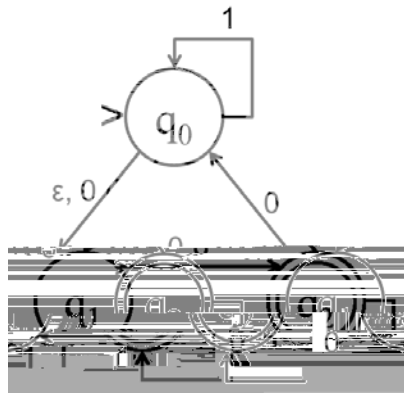   C[0..n+m-1].

Your algorithm must run in $O(n+m)$.

3. Let G = (V, E, W) be a connected undirected weighted graph with

Answer **ANY TWO** of the following three questions:

1. Convert the NFA shown below to an equivalent DFA using the standard method:

2. Provide a context-free grammar that generates the following language over {0,1}:

{w = w contains at least as many 0's as 1's and 2}

3. Answer **TRUE** or **FALSE** for each of the following statement to indicate whether the conclusion is **always true**. If you do not know the answer, do not guess. **Scoring**: +2 points for correct answer; 0 point for no answer;