Student Name: ______________________ ________ J#: ___________________

CSC 323 Algorithm Design and Analysis, Spring 2019
Instructor: Dr. Natarajan Meghanathan

Quiz 2 (Take Home) **Total: 50 points**

Due: Feb. 21, 2019 (1 PM, in-class). Quiz solutions submitted after 1 PM will not be accepted. Print this quiz, answer in the space provided (use additional sheets, if needed), staple everything together and submit.

Note: Strictly, there should NOT be any copying. If the instructor finds that two or more quiz solutions involve some sort of copying, all the concerned students found to be involved in copying will get a zero.

Q1 - 10 pts) Solve the following recurrence relation (without using Master Theorem)
$C(n) = C(n/2) + \log n$, for $n > 1$. $C(1) = 0$

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Q2 - 20 pts) Two pairs of integers (a, b) and (c, d) are said to be symmetric if b = c and a = d. For example, given an array of pairs { {31, 57}, {80, 90}, {25, 70}, {90, 80}, {70, 25}, {11, 20}, {10, 5}, {30, 40} }, the symmetric pairs are:
{80, 90} and {90, 80}
{25, 70} and {70, 25}

Design a hash table-based algorithm of time complexity Θ(n) to identify the symmetric pairs in an array of 'n' pairs.
Show the working of your algorithm for the above array of pairs with a hash function H(K) = K mod 7.

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Q3 - 20 pts)
In class, we saw the approach to count the number of inversions in a merging step of two sorted sub arrays. The total number of inversions in an unsorted array is the sum of all such inversions that could be found in the merging steps of the Merge Sort algorithm. Show your work to compute the total number of inversions in the unsorted array given below.

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