



CS70 Midterm Exam 1 Fall 2015-Sol

Analysis of Algorithms (University of Southern California)



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CS570
Analysis of Algorithms
Fall 2015
Exam I

Name: _____

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	Maximum	Received
Problem 1	20	
Problem 2	15	
Problem 3	12	
Problem 4	9	
Problem 5	12	
Problem 6	9	
Problem 7	10	
Problem 8	13	
Total	100	

Instructions:

1. This is a 2-hr exam. Closed book and notes
2. If a description to an algorithm or a proof is required please limit your description or proof to within 150 words, preferably not exceeding the space allotted for that question.
3. No space other than the pages in the exam booklet will be scanned for grading.
4. If you require an additional page for a question, you can use the extra page provided within this booklet. However please indicate clearly that you are continuing the solution on the additional page.

1) 20 pts

Mark the following statements as **TRUE** or **FALSE**. No need to provide any justification.

[**TRUE**/]

In a connected undirected graph, and using the same starting point, the depth of any DFS tree is at least as much as the depth of any BFS tree.

[**FALSE**]

Algorithm A has a running time of $\Theta(n^2)$ and algorithm B has a running time of $\Theta(n \log n)$. From this we can conclude that A can never run faster than B on the same input set.

[**FALSE**]

Let T be a complete binary tree with n nodes. Finding a path from the root of T to a given vertex $v \in T$ using breadth-first search takes $O(\log n)$ time.

[**TRUE**/]

Amortized cost of operations in a Fibonacci heap is at least as good as the worst case cost of those same operations in a binomial heap.

[**FALSE**]

Master's Theorem can be used to calculate the running time of any recursive function.

[**FALSE**]

Dijkstra's shortest path algorithm can be used to find shortest path in graphs with any edge weights.

[**FALSE**]

Function $f(n) = 5n^24^n + 6n^43^n$ is $O(n^43^n)$.

[**TRUE**/]

Stable Matching: Suppose Jack prefers Rose to others, and Rose prefers Jack to others. The pair (Jack, Rose) exists in every stable matching.

[**TRUE**/]

A DFS tree is a spanning tree.

[**TRUE**/]

A binary max-heap can be built using an unsorted list of elements in $O(n)$ time