**CMPE 300 ANALYSIS OF ALGORITHMS** 11.11.2016

###### MIDTERM

1. a) Write in pseudocode the InsertionSort algorithm as a recursive module.

b) Analyze the average case complexity of this recursive version. Your analysis must be *exact*. (During the analysis, use techniques such as dividing the analysis into parts, etc.).

1. We want to search a list L[0:n-1]. Consider the following versions of the binary search algorithm:
2. Suppose that, when the algorithm is called with the list L[low:high] at a step, the search element is compared with the list element L[low+(high-low)/4] (instead of the middle element as in the original algorithm). Then the list is divided into two for the recursive calls. Assume that the search element does not exist in the list. Analyze B(n) *exactly*. (Note that the data size can be any integer *n*.)
3. Suppose that, when the algorithm is called with the list L[low:high] at a step, the search element is compared with the list element L[high-2] (instead of the middle element as in the original algorithm). Then the list is divided into two for the recursive calls. Analyze W(n) *exactly*. (Note that the data size can be any integer *n*.)
4. Solve the following recurrence:

x(n) = 5 x(n-1) – 6 x(n-2), n≥2, x(0)=9, x(1)=20

1. Solve the following recurrence and find its Ө class: (Assume that m≤n)

$T\left(m,n\right)=2T\left(\frac{m}{2},\frac{n}{2}\right)+mn$ , m>1, n>1

$$T\left(1,n\right)=n$$

$$T\left(m,1\right)=m$$

1. Prove *formally* that Ө determines an equivalence relation on the set of functions. You must use the formal definition of Ө in the proof; do not use limit analysis.

*Some equations that you may use:*

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* , if x≠1

*Notes:*

* Where pseudocode is required, the syntax of the pseudocode must be strictly followed. No points will be given if the syntax is not followed or any other language (e.g. C) is used.
* Questions 1,3:35 points, 2:30 points
* Time: 1:45 hours
* Close notes and books

*(continued on next page)*

Herkesin bir feride’si vardır bilmez miyim

Herkesin bir ayakkabısı gibi bir de şarkısı

Herkesin bir kimsesi vardır ben bilmez miyim

Bir de kimsesizliği ...