**C. Sc. 2500- Homework 3**

**Due February 19, 2019 at the start of class**

**Questions**

1)      Given the following recursive function to insert an element x into the highest zero element of an array a:

Insert(x,a[],i)

if (i==0) return FALSE;

else if (a[i-1]==0) {a[i-1]=x; return TRUE;}

else return Insert(x,a,i-1);

What are the best, worst, and average time of Insert(x,a,n) using the recursion tree method. Verify your solutions using the substitution method.

 2)      Consider the recursive version of Binary Search that finds x in A[1..n] sorted ascending, if it exists and return its index. If x is not in A[1..n], the program returns 0. For simplicity, assume n is a power of 2.

Binsrch(A,left,right,x);

if(left>right)

return(0);

mid=⎣(right+left)/2⎦;

if (A[mid]==x)

return(mid);

else if (A[mid] <x)

Binsrch(A,mid+1,right,x;

else

Binsrch(A,left,mid-1,x);

end if;

1. Develop a recurrence for the running time T(n) of BinSrch using the recursion tree method.
2. Solve the recurrence from part a. Verify it using the substitution method.

c. Problem 4-2 – space complexity of parameter passing

3) Show the solution of following recurrence for n a power of 2:

T(n)=2T(n/2) + n n>1

T(1)=1 otherwise

is T(n)=O(nlog2n) using the substitution method.

4) Exercise 4.4-2

5) Exercise 4.4-3

6) Exercise 4.4-4

7) Problem 4-3a

8) Problem 4-3h