DSA THEORY ASSIGNMENT
Due:24-08-2020

1. **How many operations are performed in this function**
   a) **If the list has 10 elements?**
   b) **If the list has 100,000 elements?**
   c) **Does this algorithm depend on the input size?**

```
1. Funcion first (A[0...n-1])
2. // Input: An array
3. // output: return the first element
4. return A[0]
```

Ans :

a) One Operation
b) One Operation
c) No,It doesn't depend on the input size

2. **Write down the passes for bubble sort, selection sort and insertion sort for the following numbers**

Bubble sort	**3**	**89**	**23**	**12**	**55**	**2**	**90**	**49**	**97**
Pass 1	3	23	12	55	2	89	49	90	97
Pass 2	3	12	23	2	55	49	89	90	97
Pass 3	3	12	2	23	49	55	89	90	97
Pass 4	3	2	12	23	49	55	89	90	97
Pass 5	2	3	12	23	49	55	89	90	97

Selection sort	**3**	**89**	**23**	**12**	**55**	**2**	**90**	**49**	**97**

Pass 1	2	3	89	23	12	55	90	49	97
Pass 2	2	3	89	23	12	55	90	49	97
Pass 3	2	3	12	89	23	55	90	49	97
Pass 4	2	3	12	23	89	55	90	49	97
Pass 5	2	3	12	23	49	89	55	90	97
Pass 6	2	3	12	23	49	55	89	90	97

Insertion sort	**3**	**89**	**23**	**12**	**55**	**2**	**90**	**49**	**97**
Pass 1	3	89	23	12	55	2	90	49	97
Pass 2	3	89	23	12	55	2	90	49	97
Pass 3	3	23	89	12	55	2	90	49	97
Pass 4	3	12	23	89	55	2	90	49	97
Pass 5	3	12	23	55	89	2	90	49	97
Pass 6	2	3	12	23	55	89	90	49	97
Pass 7	2	3	12	23	55	89	90	49	97
Pass 8	2	3	12	23	49	55	89	90	97

3. GATE 2002 1st Question

Consider the following algorithm for searching for a given number x in an unsorted array A[l..n] having n distinct values:

1. Choose an i uniformly at random from l..nl
2. If A[i]=x then Stop else Goto 1;

Assuming that x is present A, what is the expected number of comparisons made by the algorithm before it terminates?

(a) n (b) n - 1 (c) 2n (d) $\frac{n}{2}$

Ans:(a) n

4. **GATE 2003 2nd Question**

Consider the following three claims

I. $(n + k)^m = \Theta(n^m)$ where k and m are constants

II. $2^{n+1} = O(2^n)$

III. $2^{2n+1} = O(2^n)$

Which of these claims are correct?

(A) I and II (B) I and III (C) II and III (D) I, II, and III

Ans: (A)

5. **GATE 2010 Question**

Two alternative packages A and B are available for processing a database having 10^k records. Package A requires $0.0001n^2$ time units and package B requires $10n\log_{10}n$ time units to process n records. What is the smallest value of k for which package B will be preferred over A?

(A) 12 (B) 10 (C) 6 (D) 5

Ans: (C) 6