Q1.	a) Write an Algorithm to create a min heap from a given array. Take the example of 10 array elements taken randomly and explain step by step the min heap generated using your algorithm. b) Many times it is required to change the size of the array because of the growth in size of the application input. Whether you will prefer doubling or incrementing by a constant c. Prove the answer by calculating the complexity.
Q.2	a) If we express Insertion sort as a recursive procedure, then in order to sort A[1..n], recursively sort A[1..(n-1)] and then insert A[n] into sorted array A[1..(n-1)]. Write a recurrence for the running time of this recursive version of insertion sort and find the worst case complexity. Is it better than iterative insertion sort? Write both the Recursive and Iterative Algorithms also. b) Find the lower bound on the height of any decision tree which sorts n elements using comparison sort with the help of a suitable argument. Also write and explain one sorting algorithm which is having that lower bound found above in worst and average case.
Q.3	a) Explain the Algorithm to find the successor of any element in a binary search tree. Write all cases and explain with the help of proper examples. Examples should be comprehensive to include all possible test cases. b) Why we generally go for (i) macro analysis, (ii) worst case analysis, (iii) Asymptotic analysis and (iv) Posterior analysis (v) Big Theta Analysis

Q.4	A country is planning to go to war with another country. It is dependent upon the most successful Brahmos Missile in its arsenal. It is having total n such missiles.
	Just before three days of the start of the war the intelligence officials have given a report that a terror module has been busted who was trying to change the electronic chip in the missile which will change the path of the missile and missile will take a U-Turn. However, before this terror module was busted, Terrorists were actually able to change the chip of one missile. But, nobody knows which one.
	
	Army has the following capabilities
	    1. It has the machines which can make copies any number of chips almost instantly.
	    2. It has atmost lgn systems which can test at most n chips at the same time in each system. The testing will take three days and the system will signal that it has a rogue chip or not (after three days). But the system is not able to tell which one chip is faulty.
	For the army to win a war it is very important to find the missile with the rogue chip in three days. If the missiles are numbered from 1 to n and the systems are numbered from 1 to lgn. You are given the system number(s) which will output that it has a rogue chip.
	
	Your task is to find the missile number whose chip has been replaced. Write a Algorithm to find it.
	Example Input
	n=16
	System Numbers which shows Rogue Missile : 2, 3
	Output
	Missile Number whose chip was changed is 7