Note: Each question is of two marks. Attempt the questions in the given sequence.

1	A King's garden has thousands of flowerpots which are very expensive and require careful handling. One day king's princess says that she wants to watch the flowerpots arranged in the order of 'number of flowers in each pot'. Garden supervisor orders his subordinates to move the flowerpots in such a way so that there is minimum movement in terms of the total distance moved from the current position and final position of all the flowerpots. This is required to minimize the damage that may be done to the delicate flowerpots due to heavy movements. If the supervisor takes advice from you, what kind of sorting mechanism and data structure you will suggest so as to minimize the total movement of the flowerpots. Suppose supervisor provides you with the pot number and the number of flowers in each pot. Justify your answer.
2	A Project Manager in a company is in a typical situation due to a computational problem for which he is looking for an algorithm. He asks five of his programmers to come up with a solution. P1 is always concerned about the length and structure of his code, so he comes up with the shortest code. P2 is always concerned about the memory usage his code will be using, so he comes up with a code which is taking least memory. P3 is always concerned with the time consumed by the code, so he comes up with a code that takes least time. P4 is always concerned about optimizing his program for a particular input, so he comes up with a code that works optimally in time and space for a particular input. P5 is always concerned about the correct output for all inputs, so he comes up with a code which gives the correct output for all inputs. If you are project manager what you will do. If you will choose one of the codes given by programmers. If yes, which one and why. If no, then what strategy you will use to come up with best code for your problem.
3	Let N! for any positive integer N has a value called zeroattheend(N!). We also know that if x<y then zeroattheend(x!) $\leq$ zeroattheend(y!). Given a number N write an efficient algorithm to find the value of the function zeroattheend(N!) . Your algorithm need not calculate the exact factorial of the given value and then calculate the trailing zeros. There are other efficient ideas that must be used.

4	Find the time complexity of the following code in big oh notation in terms of n
	a)An array A[i] contains square of the index of the array. Array index is starting from 1. so array elements are 1,4,9,16,25,36,…. Explain how you calculated the complexity.
	{
	int a,b;
	for i= 1 to n
	for j= 1 to A[i]
	for k= 1 to j
	{
	a=b+i;
	}
	b) {
	for i= 1 to n
	for j= i to n
	for k= j to n
	{
	a=b+i;
	if(k>i+5)
	exit;
	}

5	Your friend is working as a camp counselor who is in charge of organizing activities for a set of juniorhigh-school-age campers. One of the plans is the following mini-triathalon exercise: each contestant must swim 20 laps of a pool, then bike 10 kilometers, then run 3 kilometers. The plan is to send the contestants out in a staggered fashion, via the following rule: the contestants must use the pool one at a time. In other words, first one contestant swims the 20 laps, gets out, and starts biking. As soon as this first person is out of the pool, a second contestant begins swimming the 20 laps; as soon as he or she is out and starts biking, a third contestant begins swimming . . . and so on. Each contestant has a projected swimming time (the expected time it will take him or her to complete the 20 laps), a projected biking time (the expected time it will take him or her to complete the 10 kms of bicycling), and a projected running time (the expected time it will take him or her to complete the 3 kms of running). Your friend wants to decide on a schedule for the triathalon: an order in which to sequence the

	starts of the contestants. Let's say that the completion time of a schedule is the earliest time at which all contestants will be finished with all three legs of the triathalon, assuming they each spend exactly their projected swimming, biking, and running times on the three parts. (Again, note that participants can bike and run simultaneously, but at most one person can be in the pool at any time; also, contestants must complete the events in the same order—swimming, biking, running—to avoid giving anyone an unfair advantage.) What's the best order for sending people out, if one wants the whole competition to be over as early as possible? More precisely, give an idea that produces a schedule whose completion time is as small as possible, together with a short proof that your algorithm is correct.
6	How Insertion is done in an AVL tree. Discuss different cases including rebalancing.
7	Suppose you have algorithms with the running times listed below. (Assume that these are the exact number of operations performed as a function of the input size n.) Suppose you have a computer that can perform 10^{10} operations per second, and you need to compute a result in at most an hour of computation. For each of these, what is the largest input size n for which you would be able to get the results within an hour? a) n^2 b) n^3 c) nlogn d) 2^n

8	a) Suppose you have algorithms with running times listed below. (Assume these are exact running times.) How much slower do each of these algorithms get when you double the input size
	(i) n^2 ii) 2^n
	b) Two codes are given as following , which one of them is better and why
	Code A
	int i, w, x[1000], y[1000];
	if (w)
	{
	for (i = 0; i < 1000; i++)
	{ x[i] = x[i] + y[i];
	y[i] = 0;
	}}
	else
	{ for (i = 0; i < 1000; i++)
	x[i] = x[i] + y[i];
	}
	Code B
	int i, w, x[1000], y[1000];
	for (i = 0; i < 1000; i++)
	{
	x[i] = x[i] + y[i];
	if (w)=1
	y[i] = 0;
	}

9	Suppose you're consulting for a bank that's concerned about fraud detection, and they come to you with the following problem. They have a collection of n bank cards that they've confiscated, suspecting them of being used in fraud. Each bank card is a small plastic object, containing a magnetic strip with some encrypted data, and it corresponds to a unique account in the bank. Each account can have many bank cards corresponding to it, and we'll say that two bank cards are equivalent if they correspond to the same account. It's very difficult to read the account number off a bank card directly, but the bank has a high-tech "equivalence tester" that takes two bank cards, and after performing some computations, determines whether they are equivalent. Their question is the following: among the collection of n cards, is there a set of more than n/2 of them that are all equivalent to one another? E.g. if there are 10 cards, is there a set of more than 5 of them that are all belonging to the same account. Only feasible operations you can do with the cards are to pick two of them and plug them into the equivalence tester. Show how to decide the answer to their question with only O(n log n) invocations of the equivalence tester.
10	Explain Deletion and Insertion in an Skip List with the help of example and diagram.