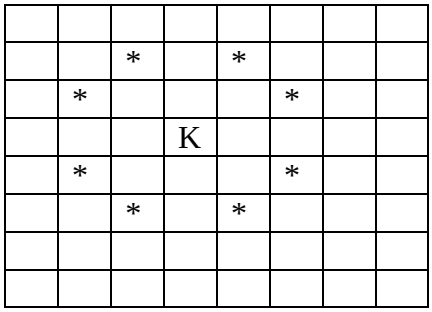
1	A	i)Two algorithms take n^3 days and 2^n seconds respectively to solve an instance of size n. What is the smallest instance on which the former algorithm outperforms the later? ii) Two different stacks have to be implemented. The limitation is that we can use only a single array. Discuss the possible option?
	B	Explain Dictionary Data Structure with its functions & applications?
	C	Write an algorithm for a function changepriority(q, x, v) to change the priority of a particular element from x to v in a priority queue q , so that after the change the queue remains the priority queue.
	D	Devise an algorithm based on Horner's Rule for converting a string of alphanumeric digits to its numeric value. If there is an alphabet in between, return it as a bad string and exit the program. Assume a function ConvertDigit exists for converting an alphanumeric digit to its integer equivalent e.g. ConvertDigit ('5') = 5. Also assume that the alphanumeric digits are input one at a time in an online fashion, so that the total number of digits is not known in advance.
2	A	Give a recursive procedure for swapping left and right children of every node in a binary tree so that after conversion it will be a mirror image of the original tree.
	B	Explain KMP algorithm for String Comparison.
	C	You have n coins that all are supposed to be gold coins of the same weight but you know that one coin is fake and weighs less than the others. You have a balance scale. You can put any number of coins on each side of the scale at one time and it will tell you if the two sides weigh the same, or which side is lighter. Outline an algorithm to find out the fake coin in minimum number of weightings. Use divide & conquer algorithm.
3	A	A Knight can make up to eight moves as shown in the figure. Starting at an arbitrary position in the nXn board, A knight's tour is a sequence of n^2-1 moves such that every square of the board is visited once. Write a backtracking algorithm that either produces a knight's tour or determines that no such tour exists.

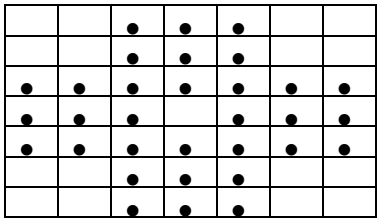


	B	Consider a sequence of n distinct integers. Design and analyze a dynamic programming algorithm to find the length of the longest increasing subsequence. For example consider the sequence 45 23 9 3 99 108 76 12 77 16 18 4 The longest increasing subsequence is 3 12 16 18 having length 4
4	A	One Popular cryptographic method for encoding a message is substituting a letter for each letter of the alphabet. Note that a substitution is a permutation of the 26 letters of the alphabet, so we can uniquely decipher a cipher text by reading the substitution backwards. Write a program that takes as an input a plain text generates a random substitution and then encrypts the plaintext using that substitution.
	B	Write an O(nlogn) algorithm that receives as input two n-element arrays a and b of real numbers and a value val. (The arrays are not sorted). The algorithm returns true if there are indexes I and J such that a[I] + b[J] = Val and false otherwise.
	C	A draft report has five chapters. The table shows the lengths of the chapters & their importance where the scale is from 1(low) to 10(high). The report must be at most 600 pages long. The problem is to edit the report so that the overall importance is maximized. Implement the fractional knapsack (Not 0-1) Algorithm using Greedy Programming. Chapter Pages importance 1 120 5 2 150 5 3 200 4 4 150 8 5 140 3 .

5	A	You are given a k×k checkerboard with a nonnegative number in each square (the square colors are not significant). A token is moved from square to square on the board. Each time the token enters a square it is charged the amount written in that square. Assume that the only legal moves are to the right, down, and diagonally right down. Give an algorithm that runs in $O(k^2)$ time to find the cost of the minimum cost sequence of moves beginning in the upper left corner of the board and ending at the lower right corner
	B	You have 6 players out of which a 2-member Table tennis team has to be selected using a computer algorithm. Every player is given the skill & experience data which is available. The multiplication of skill & experience will be the final deciding criterion for selection. Discuss the implementation of above problem using Genetic programming.
	C	Discuss 1) Approximation algorithms 2) Oracle & Adversary Arguments
6	A	Suppose n people are arranged in a circle & we are given a positive integer m <= n. Beginning with a designated first person, we proceed around the circle removing m^{th} person. After each person is removed, counting continues around the circle that remains. This continues until all n people have been removed. The order in which the people are removed from the circle defines (n,m) Josephus permutation. Suppose that n,m is a constant Describe an O(n) time algorithm that given integers n and m , outputs the (n.m) Josephus.
	B	Convex Hull of a set of points is the smallest convex polygon P for which each point in Q is either on the boundary of P or in its interior. It is like fixing a number of nails on the wall and then enclosing them with a rubber band. Design an algorithm which gives the outline for Convex Hull
	C	An evil king has a cellar containing n bottles of expensive wine, and his guards have just caught a spy trying to poison the king's wine. Fortunately, the guards caught the spy after he succeeded in poisoning only one bottle. Unfortunately they don't know which one. To make the matter worse the poison the spy used was very deadly. Just one drop diluted even to a billion will still kill someone. Even so, the poison works slowly. It takes a full month for the person to die. Design a scheme that allows the evil king to determine exactly which one of his wine bottles was poisoned in just one month's time while expending at most O(logn) of his taste testers.

	D	Differentiate a)NP & NP-Complete problems b)Deterministic & Non-deterministic algorithms

7	A	What is the running time of following algorithm in Big oh notation . Mark the statements that can be neglected while computing the time.
		Algorithm MinDistance(A[0..n-1)
		Dmin ← infinity
		For I = 0 to n-1 do
		For j= 0 to n-1 do
		If I<> J and A[I]- A[j] < dmin
		Dmin = a[I]- a[j]
		Return dmin

	B	Design an algorithm to check whether two given words are anagrams, i.e. whether one word can be obtained by permuting the letters of the other. For example Sunday, daysun, dusyan etc. are anagrams.
	C	A popular diversion in the world, word find, asks the player to find each of a given set of words in a square table filled with single letters. A word can read horizontally, vertically or diagonally in any direction. Design a brute-force algorithm for the game.
	D	The transitive closure of a digraph with n vertices can be defined as an n by n boolean matrix T such that T[i,j] =1 if there is a path between ith and jth vertex, otherwise it is zero. Design an algorithm for computing the transitive closure & determine its time efficiency.
8	A	1) Discuss Master Theorem of Divide & Conquer strategy. 2) Suppose you have an array of 1000 records in which only a few are out of order and they are not very far from their correct positions. Which sorting algorithm will you use to put the whole array in order? Justify.
	B	You have 32 movable pieces that are initially placed on a board as shown. A piece can move by jumping over its immediate neighbor horizontally or vertically into an empty square opposite. The jump removes the jumped over neighbor from the board. The goal is to remove 31 pieces to finish with a single piece at the center of the board. Write a suitable efficient algorithm for this. 
	C	Discuss 1) Heap Sort 2) Multi way search trees