School of Computer Science & Information Technology, DAVV, Indore
Class Name --- M.Tech CS I
Course Code: CS-5216
Assignment - I

Q1 Suppose we are comparing implementations of insertion sort and merge sort on the same machine. For inputs of size n, insertion sort runs in $8n^2$ steps, while merge sort runs in 64n lg n steps. For which values of n does insertion sort beat merge sort?

Q2 Where in a max-heap might the smallest element reside, assuming that all elements are distinct? Is an array that is in sorted order a min-heap? Is the array with values {23; 17; 14; 6; 13; 10; 1; 5; 7; 12}a max-heap?

Q3 Suppose that all element values are equal. What would be randomized quicksort's running time in this case?

Q4 An array of n elements contains all but one of the integers from 1 to n+1. (a)Give the best algorithm you can for determining which number is missing if the array is sorted, and analyze its asymptotic worst-case running time. (b) Give the best algorithm you can for determining which number is missing if the array is not sorted, and analyze its asymptotic worst-case running time.

Q5 Give an efficient algorithm to evaluate a polynomial. Perform mathematical analysis and give the time complexity of the algorithm.

Assignment – II

1. Given two strings str1 and str2 and operations insert, remove or replace can performed on str1. Find minimum number of edits (operations) required to convert 'str1' into 'str2'.
2. Write a program to Partition a set into two subsets such that the difference of subset sums is minimum
3. Find minimum number of coins that make a given value. Given a value V, if we want to make change for V cents, and we have infinite supply of each of C = { C1, C2, .. , Cm} valued coins, what is the minimum number of coins to make the change?
4. Given a rod of length n inches and an array of prices that contains prices of all pieces of size smaller than n. Determine the maximum value obtainable by cutting up the rod and selling the pieces. For example, if length of the rod is 8 and the values of different pieces are given as following, then the maximum obtainable value is 22 (by cutting in two pieces of lengths 2 and 6)

Assignment – III

1. Give an algorithm for determining if a graph is two-colorable, i.e. if it is possible to colour every vertex red or blue so that no two vertices of the same colour have an edge between them. Your algorithm should run in time O(V+E), where V is the number of vertices and E is the number of edges in the graph. You should assume that the graph is undirected and that the input is presented in adjacency-list form.
2. Perfect matching of an undirected graph on 2nvertices is a matching of size n, namely n edges such that each vertex is part of exactly one edge. Give a polynomial time algorithm that takes a tree on 2nvertices as input and finds a perfect matching in the tree, if such a matching exists. HINT: Give a greedy algorithm that tries to match a leaf in each step.
3. Implement a greedy algorithm to compute minimum weight spanning tree of a given undirected graph.