(3 Hours) [Marks: 80]

N.B.: 1) Question No. 1 is compulsory.
2) Answer any three out of remaining questions.
3) Assume suitable data if necessary.
4) Figures to the right indicate full marks.

Q1. (a) Compute the worst case complexity of the following program segment: (5)

```
void fun(int n, int arr[]){
 int i = 0, j = 0;
for(; i < n; ++i)
while(j < n && arr[i] < arr[j])
j++;
}
```

(b) Differentiate between greedy method and dynamic programming? (5)

(c) . What is the optimal Huffman code for the following set of frequencies, based on the first 8 Fibonacci numbers? (5)

a:1 b:1 c:2 d:3 e:5 f:8 g:13 h:21

(d) Find Longest Common Subsequence for the following: (5)
String x=ACBAED
String y=ABCABE

Q2. (a)Consider the instance of knapsack problem where n=6, M=15, profits are (P1,P2,P3,P4,P5,P6) =(1,2,4,4,7,2) and weights are (W1,W2,W3,W4,W5,W6)=(10,5,4,2,7,3). Find maximum profit using fractional Knapsack. (10)

(b) Explain divide and conquer approach. Write a recursive algorithm to determine the max and min from given elements. (10)

Q3. (a) Define AVL tree. Construct AVL tree for the following data: (10)

21,26,30,9,4,14,28,18,15,10,2,3,7

(b) A traveler needs to visit all the cities from a list (figure 1), where distances between all the cities are known and each city should be visited just once. What is the shortest possible route that he visits each city exactly once and returns to the origin city? (10)

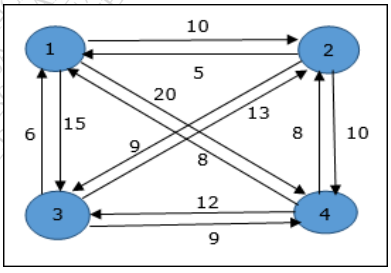

Figure 1.

Q4. (a) Construct a minimum spanning tree shown in figure 2 using Kruskal's and Prim's Algorithm and find out the cost with all intermediate steps. (10)

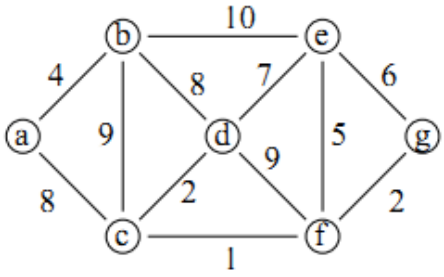

Figure 2

(b) What is optimal binary search tree? Explain with the help of example. (10)

Q5. (a) Give asymptotic upper bound for T(n) for the following recurrences and verify your answer using Masters theorem:

$$T(n) = T(n-1) + n$$ (10)

(b) Given a set of 9 jobs (J1,J2,J3,J4,J5,J6,J7,J8,J9) where each job has a deadline (5,4,3,3,4,5,2,3,7) and profit (85,25,16,40,55,19,92,80,15) associated to it .Each job takes 1 unit of time to complete and only one job can be scheduled at a time. We earn the profit if and only if the job is completed by its deadline. The task is to find the maximum profit and the number of jobs done. (10)

Q6. Explain any Two: (20)

a) Rabin Karp Algorithm
b) Genetic Algorithm
c) Minimum Cost Spanning Tree
d) Red Black Trees

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