(3 hours) **(Marks: 80)**

N.B.: (1) Question No. 1 is compulsory.
(2) Attempt any three out of the remaining five questions.
(3) Assumptions made should be clearly stated.
(4) Figures to the right indicate full marks

Q1 Solve any four (each of 5 marks) 20 Marks

(a) Give asymptotic upper bound for T(n) for the following recurrences; (5)

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

(b) Differentiate between greedy method and dynamic programming. (5)
(c) Find Longest Common Subsequence for the following: (5)
String x=ACBAED
String y=ABCADF

(d) Explain Divide and Conquer Strategy with the help of example. (5)
(e) Write note on optimal storage on tape (5)

Q2. (a)Consider the instance of knapsack problem where n=7, M=15, profits are (P1,P2,P3,P4,P5,P6,P7) =(5,10,15,7,8,9,4) and weights are (W1,W2,W3,W4,W5,W6,W7)
= (1,3,5,4,1,3,2). Find maximum profit using fractional Knapsack. (10)

Q2. (b) Define B-tree. Insert the keys 78, 52, 81, 40, 33, 90, 85, 20, and 38 in this order in an initially empty B-tree of order 3. (10)

Q3. (a) Write an algorithm for Quick Sort and sort the following elements: (10)
10,80,30,90,40,50,70

Q3. (b) Build a max heap and min heap using the following data: (10)

7, 5, 6, 4, 2, 1, 3

Q4. (a) Apply All Pair Shortest Algorithm on the graph given in figure 1 to find the shortest path. (10)

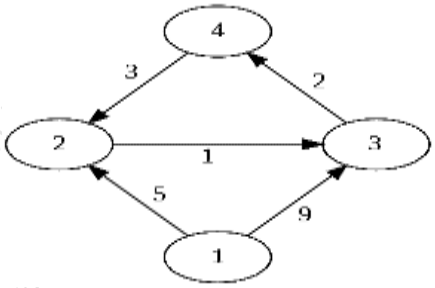

Figure 1

Q4. (b) Solve the following recurrence relation using back substitution method: (10)

$$T(n)= 2\ T(n/2)+n$$

Q5. (a) Find Minimum and Maximum elements of an array X[0 : 6] = (22, 14, 8, 17, 35, 3) using divide and conquer strategy. (10)

Q5. (b) Explain Job Scheduling with Deadline. 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) NP Class, NP hard, NP Complete

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