(1)

Exam.Code:0916
Sub. Code: 6781

1059

B.E. (Computer Science and Engineering)
Fourth Semester
CS-401: Analysis and Design of Algorithms

Time allowed: 3 Hours | Max. Marks: 50

***NOTE:** Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Part.*

x-x-x

I. Write short answers of the following:
   a. Define time complexity and space complexity of an algorithm.
   b. What are asymptotic notations? List various asymptotic notations commonly used in the analysis of algorithms.
   c. What is time complexity of conventional matrix multiplication and Strassen's matrix multiplication?
   d. Can the master method be applied to the recurrence $T(n) = 2T(n/2) + nlgn$? If no, why?
   e. What do you mean by memoization?

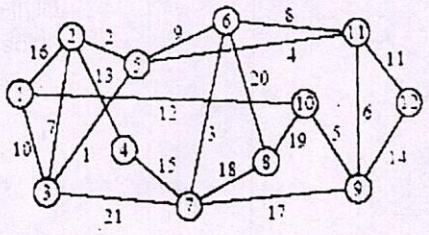
(2 marks each)

PART-A

II.
   a. What is meant by recurrence? With the help of an example describe the substitution method to find solution to a recurrence relation.
   b. Use the master method to show that the solution to the binary-search recurrence $T(n) = T(n/2) + \theta(1)$ is $T(n) = \theta(lg\, n)$. **(5,5)**

III.
   a. Write and describe an algorithm that makes use of divide and conquer strategy to find maximum and minimum from a given array of numbers.
   b. Explain Knapsack problem. Write an algorithm based on greedy strategy to provide solution to the knapsack problem. Find an optimal solution to the knapsack instance n=7, m=15, $(p_1,p_2,\ldots p_7)$ = (10,5,15,7,6,18,3) and $(w_1,w_2,\ldots w_7)$ = (2,3,5,7,1,4,1). **(5,5)**

IV.
   a. Write Kruskal's algorithm for finding minimum spanning tree. What is its time complexity? Using Kruskal's algorithm, find minimum spanning tree for the graph given below:



   b. Describe quick sort algorithm. Show how quick sort sorts the following sequence of keys 310, 285, 179, 652, 351, 423, 861, 254, 450, 520. Analyze the time complexity of the algorithm. **(5,5)**

PART-B

V. State and describe matrix-chain multiplication problem. Write and describe an algorithm to solve matrix-chain multiplication problem. Using the described algorithm, find an optimal parenthesization of a matrix-chain product whose sequence of dimensions is 5, 10, 3, 12, 5, 50, 6. **(10)**

VI. Describe a backtracking based solution to solve sum of subsets problem. Using the described solution, find all possible subsets of $w = \{5, 7, 10, 12, 15, 18, 20\}$ that sum to 35. Draw the portion of the state space tree that is generated. **(10)**

VII. Write short notes on the following:
   a. NP-completeness and reducibility
   b. N-queen's problem and it's solution **(5,5)**