Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY, MANIPAL 576104

(Constituent College of Manipal University)

FIFTH SEMESTER B.TECH. (IT) DEGREE END SEMESTER EXAMINATION, NOV/DEC – 2015
SUBJECT: DESIGN AND ANALYSIS OF ALGORITHMS - ICT 309
(REVISED CREDIT SYSTEM)

TIME: 3 HOURS **25/11/2015** **MAX. MARKS: 50**

Instructions to candidates
- Answer any **FIVE FULL** questions.
- Missing data, if any, may be suitably assumed.

1A. Write a pseudo-code to determine whether a path exist between Source and Destination nodes. Analyse the time complexity for performing different operations on Linked Adjacency List (any 3 operations).

1B. Find the shortest paths between all pair of points for the graph given in Figure Q.1B. How to identify the intermediate nodes along the path?

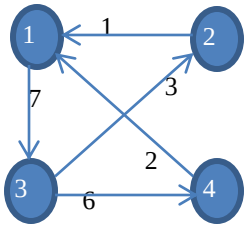

Figure Q.1B

1C. What do you mean by P and NP problems explain with example.

[5+3+2]

2A. For the graph given in Figure Q.2A, find the minimum cost optimal path for the traveling salesperson problem using Backtrack technique. (Mention all the intermediate data clearly). Analyse the space and time complexity for the same.

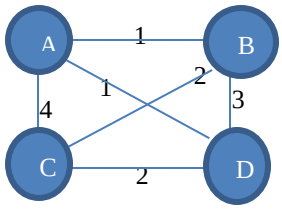

Figure Q.2A

2B. Find the average time complexity of Quick sort algorithm.

2C. Give the pseudo-code for Merge sort algorithm. Analyse the time complexity for the same.

[5+3+2]

3A. Write a recursive DFS function. Find the space and time complexity using step-per execution method for the same.

3B. Give the pseudo-code for the merge sort. Analyse the time complexity.

3C. The median of n elements can be found in O(n)time. What is the time complexity of quick sort, in which median is selected as pivot?

[5+3+2]

4A. Write a pseudo-code to find the topological order and showing all the steps find the topological order for the graph given in Figure Q.4A. Specify the greedy criteria for the same.

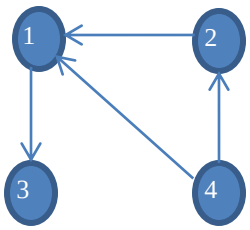

Figure Q. 4A

4B. Write a greedy criteria and pseudo-code for the change making problem which makes a change of a given amount using the smallest possible number of coins.

4C. Solve the following recurrence equation using substitution method and verify using Master theorem. $T(n) = T(n/2) + 1$; assume $n= 2^k$ and $T(1) =1$.

[5+3+2]

5A. What is the use of bounding function when solving 0/1 knapsack problem using Branch and Bound technique? Solve the following Heap version of 0/1 knapsack instance by applying bounding function. N=3, W= {20, 15, 15}, P= {40, 25, 25}, and C= 30.

5B. Write a pseudo-code to determine whether given graph has a cycle. Analyse the space complexity of the same.

5C. What is the basic idea behind Branch and Bound problem solving technique? Which data structure is suitable to implement this idea? In which scenario this technique is most applicable?

[5+3+2]

6A. Find the multiplication of the following matrix using Strassen's method. Analyse the time complexity for the same.

$$A = \begin{matrix} 1 & 0 \\ 2 & 1 \end{matrix} \qquad B = \begin{matrix} 1 & 0 \\ 2 & 1 \end{matrix}$$

6B. Define all the asymptotic notations.

6C. Mention and give the proof for the total number of out-degrees for a Digraph G, with 'n' number of nodes and 'e' number of edges.

[5+3+2]