Subject: DESIGN & ANALYSIS OF ALGORITHMS

Time: 3 Hours **Max. Marks: 100**

DECEMBER 2010

NOTE: There are 9 Questions in all.

- **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
- **The answer sheet for the Q.1 will be collected by the invigilator after half an hour of the commencement of the examination.**
- **Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1 Choose the correct or the best alternative in the following: **(2×10)**

a. Which complexity has a maximum growth rate?

(A) O (n^2) **(B)** O (n^3)
(C) O (n^{100}) **(D)** O (n!)

b. What is the best complexity in case of sorting by comparison?

(A) O (n^2) **(B)** O (n)
(C) O (n log n) **(D)** Constant

c. Which sorting algorithm has worst space complexity amongst these?

(A) Selection Sort **(B)** Insertion Sort
(C) Merge Sort **(D)** Quick Sort

d. Travelling Salesman problem belongs to complexity class _____

(A) P **(B)** NP
(C) P & NP **(D)** None of above

e. What is the prerequisite for binary search?

(A) Array **(B)** LinkList
(C) Sorted List **(D)** Reverse sorted list

f. Which Data Structure is most space efficient?

(A) Array **(B)** LinkList
(C) B-Tree **(D)** Circular Queue

g. What is the complexity of sorting by counting?

(A) Linear **(B)** Quadratic
(C) Polynomial **(D)** Constant

h. Which algorithm yields best running time for shortest path?

(A) Prim's Algorithm **(B)** Kruskal's Algorithm
(C) Dijkstra's Algorithm **(D)** All the same

i. Which is the best approach to solve 8 queens puzzle?

(A) Dynamic Programming **(B)** Greedy Strategy
(C) Backtracking **(D)** Branch and Bound

j. What is the worst case complexity of quick sort?

(A) O (n) **(B)** O (n^2)
(C) O (n^3) **(D)** O (n!)

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

Q.2 a. What are the various asymptotic notations? Explain in detail with suitable illustrations. **(7)**

b. What is recursion? How do you analyse recurrences with the master method? **(9)**

Q.3 a. Consider the following algorithm for the searching problem:
Linear search (A[0, …..n – 1], Key)
for i ← 0 to n – 1 do
if key == A[i]
return i
(i) Apply this algorithm to search the list 10, 92, 38, 74, 56, 19, 82, 37 for a key value 74.
(ii) Is this algorithm efficient? Calculate its best & worst case complexity. **(10)**

b. Define an algorithm? What are the characteristics of a good algorithm? **(6)**

Q.4 a. Explain Merge Sort and find its complexity through the recurrence equation. **(10)**

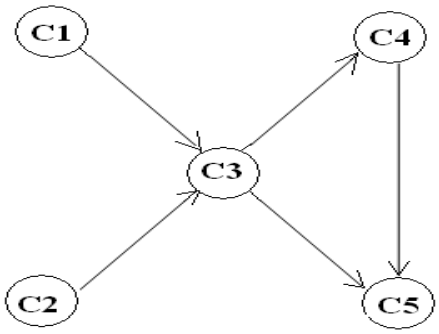
b. Explain the procedure for Strassen's Matrix multiplication. **(6)**

Q.5 a. Write the algorithm for insertion and deletion in binary search tree. **(7)**

b. Write the algorithm for heapsort. Explain the heapify procedure in detail using the list 1, 8, 6, 5, 3, 7, 4. **(9)**

Q.6 a. Write and explain the algorithm for DFS method for graphs and find its complexity. **(8)**

b. What is topological sorting problem? Apply the DFS-based algorithm to solve the topological sorting problem for the following diagraphs



Show value of dat **(8)**

Q.7 a. What is a minimum spanning tree? Write the Kruskal's Algorithm for MST and analyze its complexity. **(8)**

b. Write and explain the Floyd-Warshall Algorithm for all pairs shortest paths. **(8)**

Q.8 a. What are hash tables? Explain collision resolution with chaining method. **(8)**

b. What is a stable sorting algorithm? Write and explain counting sort algorithm using array 62, 31, 84, 96, 19, 47. Show values in array after each pass. **(8)**

Q.9 a. What is Backtracking? Show by an algorithm how backtracking is applied to solve the Hamiltonian circuit problem? **(8)**

b. Solve the following instance of the knapsack problem by the branch-and-bound algorithm. (W = 15) **(8)**

Item	Weight	Profit
1	5	$40
2	7	$35
3	2	$18
4	4	$4
5	5	$10
6	1	$2