Registration No. : | | | | | | | | | | |

Total number of printed pages – 2

MCA

MCC 301

Special Examination – 2012

DESIGN AND ANALYSIS OF ALGORITHMS

Full Marks – 70

Time : 3 Hours

*Answer Question No. **1** which is compulsory and any **five** from the rest.*

The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10

(a) Explain what is asymptotic notation.

(b) What are lower bounds ?

(c) What are NP-hard Problems ?

(d) Define a Minimal spanning Tree.

(e) What is Convex Hull Problem ?

(f) What are Memory Functions ?

(g) What is Topological Sorting ?

(h) What is an AVL tree ?

(i) What are Decision Trees ? Explain.

(j) What is amortized efficiency ?

2. Sort the following list of numbers in the descending order : 10

187, 62, 155, 343, 184, 958, 365, 427, 78, 94, 121, 388 using each of the following methods :

(i) Insertion Sort

(ii) Selection Sort

(iii) Heap Sort

(iv) Merge Sort

(v) Quick Sort

Further, count the number of operations, by each sorting method.

P.T.O.

3. (a) Draw a decision tree and find the number of key comparisons for the worst and average cases for the three-element basic bubble sort. 5

(b) Explain Euclid's Algorithm to find the GCD of two integers with an example. 5

4. (a) Prove that any weighted connected graph with distinct weights has exactly one minimum spanning tree. 5

(b) What is Dynamic programming ? Apply this technique to find all pairs shortest path in a graph. 5

5. (a) Define P, NP and NP-Complete problems. 5

(b) Given a set S= (1, 3, 5, 4) and X = 8, find the subset - sum using backtracking approach. 5

6. (a) Write a backtracking algorithm for the sum of subsets problem using the state space tree corresponding to the variable tuple size formulation. 5

(b) Present an algorithm for a FIFO branch-and-bound search for a least-cost answer node. 5

7. (a) In the flow network, define the terms maximum cut, residual network, ugmenting path, capacity and flow. Use the Ford-Fulkerson algorithm to find the maximum flow in any flow network. 5

(b) Write the approximation algorithm for solving the TSP problem. 5

8. A directed Hamiltonian cycle DHC in a directed graph G = (V, E) is a directed cycle of length n =|V|, where |V| is the number of vertices in G. So, the cycle goes through every vertex exactly once and then returns to the starting vertex. The DHC problem is to determine if a given directed graph G has a directed Hamiltonian cycle. Show that DHC is NP-Hard. 10