

UNIVERSITY OF HYDERABAD
Department of Computer & Information Sciences
ALGORITHMS MTECH AI MINOR 1

5 SEPT 2009 Total Marks: 20 Duration: 2 hours

Each question carries 5 Marks

1. (a) Using asymptotic notation of O and Θ , order the following functions where $0 < \epsilon < 1$.

$$n^{1+\epsilon}, (n+1)!, 2^n, n \log n, n^2, 1, \log(n^2)$$

- (b) Solve the recurrence relation to get the complete solution for

$$T(n) = T(n-1) + T(n-2) - T(n-3) + n^2 \text{ for } n > 1 \text{ with } T(1) = 1$$

2. (a) Write Disjkstra's algorithm to find the shortest paths from a given source to all the vertices of the graph. Discuss the time-complexity for sparse as well as dense graphs.

- (b) Explain how to modify Dijkstra's algorithm to produce the count of number of different minimum paths from source to each of the vertices of the graph.

3. Suppose you are given a sorted list of n elements followed by $f(n)$ number of unsorted elements. If we use (a) insertion sort and (b) merge sort algorithms to sort this list, discuss what will be the best and worst case complexities if

- $f(n) = O(1)$
- $f(n) = O(\log n)$

4. (a) Propose a method to find the maximum element in a Min-heap. What is the best and worst case complexities of your algorithm.

- (b) Suppose that a minimum spanning tree (MST) for a graph G is already computed using Kruskal's algorithm. Discuss how quickly can the MST be updated if a new vertex and incident edges are added to G ?

+++++GOOD LUCK+++++