Roll Number: *Thapar University Patiala*

Department of Computer Science & Engineering

ME-CS and IS (1st Semester) EST Dec 2012 PCS-101: Advance Data Structures

Time: 03 Hours; MM: 40 Name of Faculty: Deepak Garg

Note: All Questions are compulsory.

1	a) What are the properties of a Binary Heap Data Structure? Explain with example and differentiate from Binary Search Tree. b) Given a random input, how we can heapify the data in the given array in O(n) time. Explain with the help of the algorithm and example. c) How heap data structure is useful in all applications of priority queues. Discuss. d) Heap sorting can be done in O(nlogn) time. Discuss with the help of an example and prove the correctness of the complexity.	2 2 2 2
2	a) Union Find (Disjoint Set) Data structure is very useful in real life applications. What is Union-Find data structure? How the Union Takes place using Link List data structure. b) Explain two improvements in the Union-Find Data Structure that makes the Union of two sets almost in O(n) time due to the nature of Ackermann Function.	4 4
3	Knuth-Morris-Pratt Algorithm does string matching in O(m) time, where m is the length of the string. a) How the border is calculated using the Preprocessing function. Explain with the help of an example and write the algorithm. b) Explain the KMP search algorithm (After the preprocessing) with the help of algorithm and example.	4 4
4	a) Show the merge operation in Binomial Heaps with the help of an example which should include all possible cases. b) Why the Union operation is postponed in Fibonacci Heaps. How the decrease key operation takes place in Fibonacci Heaps.	4 4
5	a) Write all cases of deletion in Red Black Trees with proper diagrams. b) Solve All pair-Shortest path problem in a graph with Popular Bellman-Ford Algorithm.	4 4