Roll Number:_____

Thapar University, Patiala
Department of Computer Science and Engineering

M. E. (First Year): Semester-I (CSE/CSA/SE/IS)	Course Code: PCS104 Course Name: Advanced Data Structures and Algorithms
December 18, 2015	Friday, 14.00 – 17.00 Hrs
Time: 3 Hours, M. Marks: 100	Name Of Faculty: Dr. Deepak Garg

Note: All questions are compulsory.

Q.1 (a): Give complete KMP algorithm for string matching. It should give the preprocessing and searching algorithms separately.Given the pattern: 101001 and string: 110101010100111111, solve this using KMP.   7

Q.1 (b): Priority Queue using Heap Data Structure has always been a data structure of choice for many applications. Discuss its beauty in terms of its salient features. How it performs in terms of access and modification. How it performs better than other peer formations in terms of resource complexity.   7

Q.2 (a): What is Topological sort? Write complete algorithm for Topological Sort. Sort the following using topological sort: 7
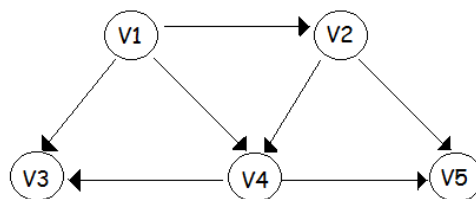
Q.2 (b) Why we will like to use insertion sort as part of a merge sort. Write an algorithm for Merge Sort which uses insertion sort as a sub-sorting algorithm.   7

Q.3 (a)Explain the difference between Dijkstra's and Floyd's Algorithm for finding the shortest path?Solve the following using Floyd's Algorithm: 7
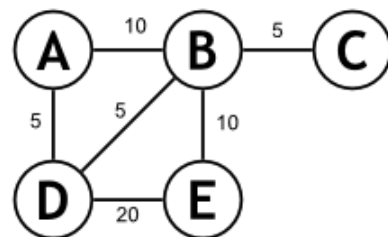
Q.3 (b) Splay trees display the Dynamic Finger and Working Set properties. How? Also enumerate the process of splaying as part of deletion in splay trees.   7

Q.4 (a): Explain Deletion in Red Black Tree.

Given an empty Red Black Tree, perform insertion of nodes in the following order: 2, 1, 4, 5, 9, 3, 6, 7.   7

Q.4 (b): Differentiate between Greedy and Dynamic Algorithms with appropriate examples?   7

Q.5 (a): Let A= {a/20, b/15, c/5, d/15, e/45} be the alphabet and its frequency distribution. Construct the Huffman tree and algorithm.   7

Q.5 (b): Give an algorithm for Chain Matrix Multiplication. Which problem solving approach does it use? Given a chain of four matrices: A_1, A_2, A_3 and A_4. With $p_0= 5$, $p_1= 4$, $p_2=6$, $p_3= 2$ and $p_4=7$. Find m[1,4].   7

Q. 6 (a): Non Deterministic Polynomial Class of problems can be solved in Polynomial time using an elusive Turing Machine. Explain. Take the example of sorting to prove your point.   7

Q. 6 (b) How Approximation algorithms have come as a great hope for NP class of problems. Discuss 2-approximation algorithm for Vertex Cover problems.   7

Q.7: Explain the following in sufficient detail with appropriate algorithm/examples: 2*8
   i)   Deletion in Skip List
   ii)   Deletion in AVL tree