CS204 Algorithms [End-Semester Exam 2014]

Time: 3hours   Marks:50

Note:- All questions carry equal marks. Attempt the question paper in a sequence. Answer all parts of a question together.

1.(a) Define the classes (i) NP (ii) NP-Complete (iii) NP-Hard
 (b) Define the problems (i) Hamiltonian Path (ii) Travelling Salesman (iii) 3-SAT. State to which classes do they belongs.

2. Prove that problems CLIQUE, INDEPENDENT SET, and VERTEX COVER are NP-Complete by reduction using 3-SAT problem.

3. (a) Define the Longest Common Subsequence (LCS) problem
 ɔ) Explain the LCS Algorithm using dynamic programming approach.

4. (a) Briefly explain 3 methods of Amortized Analysis using Dynamic Tables.
(b) Which of amortized method is used for analyzing BFS?

5. (a) Define the disjoint-set data structure and its time complexity of operations.
(b) Explain the Kruskal's Algorithm time complexity using disjoint-set data structure?

6. (a) Explain the algorithm design similarities between Prim's Algorithm for MST problem and Dijkstra's Algorithm for shortest path problem.
(b) Explain the difference between BFS and Dijkstra's Algorithms

7. (a) Briefly explain variants of shortest-path problems SSSP, SDSP, SPSP,APSP, ɔscussed in class.
(b) What are the data structure and algorithm design techniques used in Dijkstra Algorithm?
(c) Can a shortest-path contain a cycle (ie 0-weight cycle, negative-weight cycle, positive-weight cycle)?
(d) Briefly explain the difference between Bellman-Ford and Dijkstra's Algorithm.

8. Explain the Johnson's Algorithm.

9. Explain Ford-Fulkerson Algorithm

10. Using DFS algorithm, explain how to find (i) Classification of edges ie(tree, back, forward, cross) (ii) Topological sort of DAG (iii) Strongly connected-components.