

Code : 051606

B.Tech 5th Semester Exam., 2015

DESIGN AND ANALYSIS OF ALGORITHMS

Time : 3 hours

Full Marks : 70

Instructions :

- (i) The questions are of equal value.
- (ii) There are **NINE** questions in this paper.
- (iii) Attempt **FIVE** questions in all.
- (iv) Question No. 1 is compulsory.

1. Choose the correct answer from the following (any seven) :

(a) What is the worst case complexity of bubble sort?

- (i) $O(1)$
- (ii) $O(\log_2 n)$
- (iii) $O(n)$
- (iv) $O(n^2)$

(b) Suppose that a graph $G = (V, E)$ is implemented using the adjacency lists, what is the complexity of a BFS algorithm of G ?

- (i) $O(V^2)$
- (ii) $O(V \cdot E)$
- (iii) $O(V^2 \cdot E)$
- (iv) $O(V + E)$

(c) The running time of quick-sort largely depends on

- (i) no. of inputs
- (ii) selection of pivot element
- (iii) size of element
- (iv) arrangement of element

(d) Prim's algorithm based on

- (i) greedy
- (ii) divide and conquer
- (iii) dynamic programming
- (iv) graph algorithm

(e) Travelling salesperson problem is example of

- (i) dynamic
- (ii) greedy
- (iii) divide and conquer
- (iv) graph

(f) Time complexity of Kruskal's algorithm is

- (i) $O(V^2)$
- (ii) $O(V^3)$
- (iii) $O(V + E)$
- (iv) $O(E \log E)$

(g) The time complexity of Dijkstra's algorithm is

- (i) $O(n)$
- (ii) $O(\log_2 n)$
- (iii) $O(n^2)$
- (iv) None of the above

(h) How many distinct MST of an undirected graph of 5 nodes can you obtain?

- (i) 5
- (ii) 20
- (iii) 10
- (iv) Depend on the graph

(i) Strassen's matrix multiplication complexity is

- (i) $O(n^3)$
- (ii) $O(n^2)$
- (iii) $O(n^{2.81})$
- (iv) None of the above

(j) All-pair shortest path complexity is

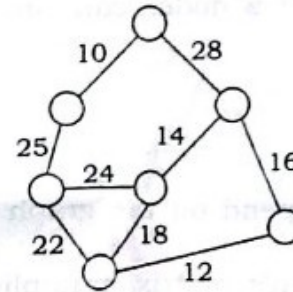
- (i) $O(n^3)$
- (ii) $O(n^2)$
- (iii) $O(n)$
- (iv) None of the above

2. (a) Write the algorithm for quick-sort and find its complexity.

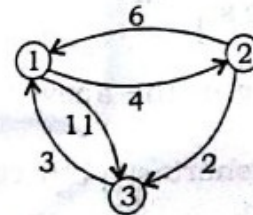
(b) Discuss the Strassen's matrix multiplication approach.

3. (a) Write the algorithm for Kruskal's algorithm.

(b) Apply Prim's algorithm to find the MST :



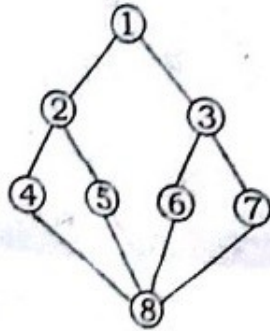
4. (a) Find the all-pair shortest path for the following :



(b) Discuss the knapsack problem using dynamic programming.

5. (a) Write an algorithm for randomized quick-sort.
(b) Discuss its time complexity.

6. (a) Write DFS algorithm.
(b) Apply DFS for the following graph :



7. (a) Discuss the single-source shortest path algorithm.
(b) What do you mean by strongly connected components? Explain with an example.

8. (a) Explain the classes NP-hard and NP-complete.
(b) Find the time complexity of the following :

$$T(n) = 7T\left(\frac{n}{2}\right) + 18n^2$$

9. (a) Discuss the average, worst, best time complexity of the algorithm. Give suitable examples.
(b) Write and discuss the selection sort algorithm.
