

## **MCA–12/M. Sc. IT–12**

### **Design and Analysis of Algorithm**

Master of Computer Application/Master of Science  
in Information Technology  
(MCA/M.Sc. IT–11/12/16/17)

Third Semester, Examination, 2017

**Time : 3 Hours**

**Max. Marks : 80**

**Note :** This paper is of **eighty (80)** marks containing **three (03)** Sections A, B and C. Learners are required to attempt the questions contained in these Sections according to the detailed instructions given therein.

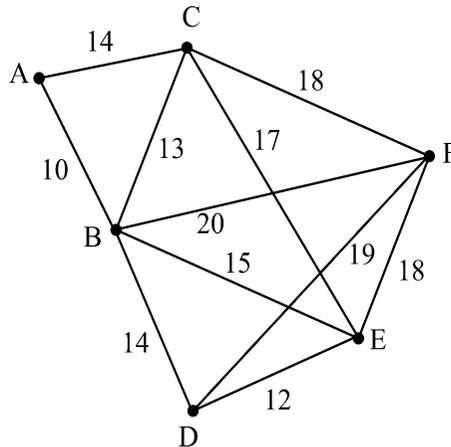
#### **Section–A**

##### **(Long Answer Type Questions)**

**Note :** Section ‘A’ contains four (04) long answer type questions of nineteen (19) marks each. Learners are required to answer *two* (02) questions only.

1. Write and explain NP-Hard and NP-completeness. approximation algorithms.
2. Explain Dijkstra’s algorithm and also find the time complexity of Dijkstra’s algorithm.
3. What is big ‘Oh’ notation ? State the best case and worst case analysis of algorithm.

4. Use Kruskal's algorithm to find a minimum spanning tree for the network.



### Section-B

#### (Short Answer Type Questions)

**Note :** Section 'B' contains eight (08) short answer type questions of eight (08) marks each. Learners are required to answer *four* (04) questions only.

1. Write and explain Time and Space Complexity.
2. Write and explain Travelling-Salesman problem.
3. Explain heap sort with example. Use your own data.
4. Write and explain Big-O and Omega Notation.
5. Write and explain Kruskal's algorithm.
6. Write and explain 8 queen problem, use your own data.
7. Define P and NP class of problem.
8. Why quick sort is also called as partition and exchange sort ? Derive its best and worst case running time.

**Section-C****(Objective Type Questions)**

**Note :** Section 'C' contains ten (10) objective type questions of one (01) mark each. All the questions of this Section are compulsory.

1. The minimum number of colours needed to colour a graph having  $n > 3$  vertices and 2 edges is :
  - (a) 2
  - (b) 4
  - (c) 3
  - (d) 1
2. The worst case time complexity of the non-deterministic dynamic knapsack algorithm is :
  - (a)  $O(n \log n)$
  - (b)  $O(\log n)$
  - (c)  $O(n^2)$
  - (d)  $O(n)$
3. Which one of the following is true ?
  - (a) All NP hard problems are NP complete
  - (b) All NP complete problems are NP hard
  - (c) Some NP complete problems are NP hard
  - (d) None of the these
4.  $G(V, E)$  is described as :
  - (a) Graph
  - (b)  $\log N$
  - (c) Binary Tree
  - (d) None of above

5. Bubble sort is the fastest algorithm.
  - (a) True
  - (b) False
6. How many number of comparisons are required in insertion sort to sort a file if the file is already sorted ?
  - (a)  $N^2$
  - (b)  $N$
  - (c)  $N - 1$
  - (d)  $N/2$
7. A problem is said to be NP-Complete :
  - (a) If it is as 'hard' as any problem in NP
  - (b) A non-polynomial time algorithm has been discovered
  - (c) A polynomial time algorithm can exist but needs a parallel computer
  - (d) There is Greedy solution to the problem
8. Complexity of insertion sort in worst case is :
  - (a)  $T(n)$
  - (b)  $T(N \log N)$
  - (c)  $T(N^2)$
  - (d)  $T(n^3)$
9. A Hamiltonian circuit is :
  - (a) A cycle that passes through all the vertices of a graph.
  - (b) The shortest cycle through all vertices of a graph.

- (c) A cycle that passes through all the vertices of a graph exactly once.
  - (d) Cycle through points which form the smallest polygon that contains all points of a set of points.
  - (e) The fastest cycle through distinct vertices of a graph.
10. Which of the following algorithms is used to find minimum spanning tree ?
- (a) Dijkstra's algorithm
  - (b) Bellman-Ford algorithm
  - (c) Prim's algorithm
  - (d) None of the above

