

**MCA-12/MSc. IT-12****Design and Analysis of Algorithm**

Master of Computer Application/Master of Science in  
Information Technology

(MCA/MSc.IT-11/12/16/17)

3rd Semester Examination, 2019

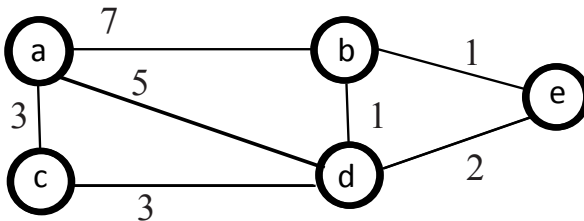
Time : 3 Hours

Maximum Marks : 80

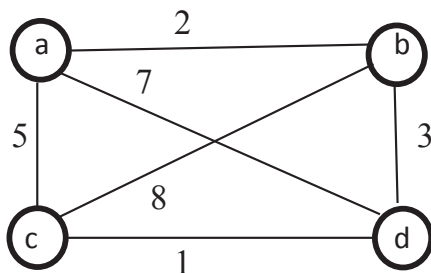
**Section –A****(Long Answer Type Questions)**

Section “A” contains four(04) long answer type questions of Nineteen(19) marks each. Learners are required to any two(02) questions only. (2 x 19 = 38)

1. What is Minimum Spanning Tree? Find the minimum spanning tree for the following graph using Prim’s and Kruskal Algorithm :



2. Apply branch and bound technique to solve the Travelling Salesmen Problem for:



3. Answer the following :

(a) What is difference between quick sort and merge sort algorithm? (6)

(b) What is internal and external sorting? Give examples. (6)

(c) Sort the following elements using quick sort. (7)

34 12 45 67 55 23 11 17 19 38 28 44 40

4. Answer the following :

(a) Write algorithm for single source shortest path. (10)

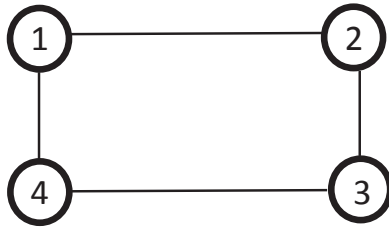
(b) Explain the job scheduling problem with deadline using an example. (9)

### Section –B

#### (Short Answer Type Questions)

Section “B” contains eight (08) short answer type questions of eight(08) marks each. Learners are required to answer any four (04) questions only. (4 x 8 = 32)

1. Explain briefly the Big Oh Notation, Omega Notation and Theta Notation. Give example.
2. Explain graph coloring problem using the following graph. Solve it for three colors.



3. Write a recursive and non-recursive function for binary search algorithm.
4. Explain fractional knapsack problem using suitable example.
5. Explain 8-Queens Problem.
6. Write an algorithm to sort elements by bubble sort algorithm.
7. Define greedy algorithm. Explain any two characteristics of greedy algorithms
8. Describe the backtracking solution to the 8-queen problem.

### Section –C

#### (Object Type Questions)

Section “C” contains ten (10) objective type questions of one(01) marks each. All the questions of this section are compulsory. (10 x 1 = 32)

1. Running merger sort on an array of size  $n$  which is already sorted is :
  - (a)  $O(n^2)$
  - (b)  $O(\log n)$
  - (c)  $O(n)$
  - (d)  $O(n \log n)$
  
2. The time complexity of heap sort in worst case is
  - (a)  $O(n^2)$
  - (b)  $O(\log n)$
  - (c)  $O(n)$
  - (d)  $O(n \log n)$
  
3. The space factor when determining the efficiency of algorithm is measured by
  - (a) Counting the maximum memory needed by the algorithm
  - (b) Counting the minimum memory needed by the algorithm
  - (c) Counting the average memory needed by the algorithm
  - (d) Counting the maximum disk space needed by the algorithm

4. Which of the following algorithms has lowest worst case time complexity?
- (a) Insertion sort
  - (b) Heap sort
  - (c) Selection sort
  - (d) Quick sort
5. Which of the following standard algorithms is not Dynamic Programming based.
- (a) Bellman-Ford algorithm
  - (b) Floyd Warshall Algorithm
  - (c) 0-1 knapsack problem
  - (d) Prim's algorithm
6. A \_\_\_\_\_ is a round trip path along  $n$  edges of  $G$  that visits every vertex once and returns to its starting position.
- (a) MST
  - (b) TSP
  - (c) Hamiltonian cycle
  - (d) Multistage graph
7. The Knapsack problem where the objective function is to minimize the profit is \_\_\_\_\_
- (a) Greedy
  - (b) Dynamic 0/1
  - (c) Back Tracking
  - (d) Branch & bound 0/1

8. Which of the following algorithm is of divide-and-conquer type?
- (a) Bubble sort
  - (b) Quick sort
  - (c) Insertion sort
  - (d) All of the above
9. Let  $X$  be a problem that belongs to the class NP. Then which one of the following is TRUE?
- (a) There is no polynomial time algorithm for  $X$
  - (b) If  $X$  can be solved deterministically in polynomial time, then  $P=NP$
  - (c) If  $X$  is NP-hard, then it is NP-complete
  - (d)  $X$  may be undesirable
10. Graph coloring is which type of algorithm design strategy:
- (a) Backtracking
  - (b) Greedy
  - (c) Branch and bound
  - (d) Dynamic programming