



BRAINWARE UNIVERSITY

Term End Examination 2018 - 19

Programme – Bachelor of Technology in Computer Science & Engineering

Course Name – Design and Analysis of Algorithm

Course Code – BCSE401

(Semester – 4)

Time allotted: 3 Hours

Full Marks: 70

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group –A

(Multiple Choice Type Question)

10 x 1 = 10

1. *Choose the correct alternative from the following*
 - (i) Which of the following problem is solved by using Branch and Bound Method?

a. Knapsack Problem	b. Hamiltonian Problem
c. Travelling Salesman Problem	d. 15 Puzzle Problem
 - (ii) Which one is true of the following?

a. All NP hard problems are NP Complete	b. Some NP complete problems are NP hard
c. All NP Complete problems are NP hard	d. None of the these
 - (iii) The fractional Knapsack problem can be solved by using

a. Greedy Method	b. Dynamic Programming
c. Divide and Conquer Method	d. None of the these
 - (iv) Which of the following is used to depict the working of algorithm?

a. Flowchart	b. Pseudo Code
c. Source Code	d. All of the above
 - (v) Lower bound of any comparison sort is

a. $O(\log n)$	b. $O(n^2)$
c. $O(n \log n)$	d. $O(n^2 \log n)$
 - (vi) Optimal substructure property is exploited by

a. Dynamic Programming	b. Greedy Method
c. Both (a) and (b)	d. None of the these

- (vii) Which of the following approaches is adopted in divide and Conquer Algorithm?
 - a. Top – Down
 - b. Bottom –Up
 - c. Both (a) and (b)
 - d. None of these
- (viii) The edge, removal of which makes a graph disconnected is called
 - a. Pendent Vertex
 - b. Bridge
 - c. Articulation point
 - d. Coloured Vertex
- (ix) Tight bound for finding a minimum spanning tree of an undirected cyclic graph of E and V vertices is
 - a. $O(E^2)$
 - b. $O(V^2)$
 - c. $O(E \log E)$
 - d. $O(V \log V)$
- (x) Consider the following statements:
 - I. NP hard problem is a subset of NP Complete problem
 - II. An Algorithm to multiply two matrices has complexity $O(n^3)$
 - a. I - True, II - False
 - b. Both True
 - c. Both False
 - d. I – False, II – True

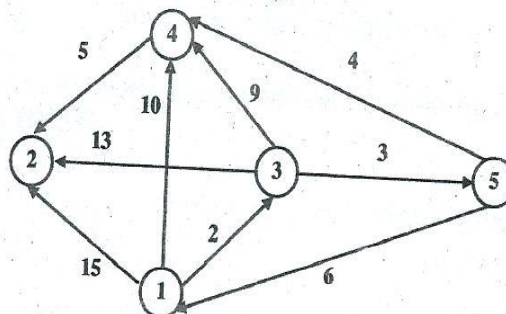
Group – B

(Short Answer Type Questions)

3 x 5 = 15

Answer any *three* from the following

- 2. (a) Discuss Different types of asymptotic notation. [3]
- (b) Prove that $n! = O(n^n)$ [2]
- 3. (a) Explain what is meant by order of an algorithm? [2]
- (b) Discuss the criterion on which the measures of complexity depend. [3]
- 4. Find out the shortest path from vertex 1 to all remaining vertices for the following graph using Dijkstra’s Algorithm. [5]



- 5. (a) Discuss the procedure for Strassen’s matrix multiplication to evaluate the product of n matrices. [3]
- (b) Is Strassen’s matrix multiplication method an improvement over the conventional matrix multiplication method? If so why? [2]
- 6. Describe Floyd’s Algorithm for all pair shortest path problem. Find the time Complexity. [5]

Group – C

(Long Answer Type Questions)

3 x 15 = 45

Answer any *three* from the following

7. (a) Explain the basic concept of divide & conquer algorithm. [3]
- (b) Let $A[1..n]$ be a sorted array of n distinct integers. Give a Divide and Conquer algorithm that find an index I such that $A[i] = i$ (if one exists) with running time $O(\log n)$ [5]
- (c) Prove that the average case time – complexity of quick sort is $O(n \log n)$. You should state clearly the reasons behind the design of the recurrence relation. [4]
- (d) Merge Sort algorithm an optimal algorithm? Justify your answer. [3]
8. (a) What is the difference between a 0/1 Knapsack problem and fractional Knapsack problem? [4]
- (b) Establish the theoretical minimum lower bound of time complexity for any sorting algorithm where sorting is performed by pair wise comparison. [6]
- (c) Find out the optimal solution for the fractional Knapsack problem with capacity 60 is given below: [5]

$w = \{5, 10, 20, 30, 40\}$
 $v = \{30, 20, 100, 90, 160\}$
9. (a) Discuss activity selection problem for job sequencing. [4]
- (b) Find the optimal solution using greedy criteria for Knapsack having capacity 100 kg for the following list of items having values and weights as shown in the table [5]

Items	I_1	I_2	I_3	I_4	I_5
Value	10	20	30	40	50
Weight	15	25	35	45	55
- (c) What is the difference between BFS and DFS? [3]
- (d) Explain the “max flow min cut” theorem with example. [3]
10. (a) What is the difference between linear search and binary search? [2]
- (b) Write an efficient algorithm to find the K^{th} largest value among n numbers. [4]
- (c) Write the algorithm of Quick Sort. [5]
- (d) Find the best case, worst case and average case time complexity of Quick Sort algorithm. [4]
11. Write a short note of any three of the following. [3x5]
 - (a) Strassen’s matrix multiplication
 - (b) Graph Coloring Problem
 - (c) Travelling Salesman problem: An approximation Algorithm
 - (d) Heap Tree
 - (e) Disjoint Set
