Seat. No. 225291

KADI SARVA VISHWAVIDYALAYA

BE CE/CSE SEMESTER-V(New) EXAMINATION OCTOBER/NOVEMBER - 2023

Subject Name: Design & Analysis of Algorithm **Subject Code: CE504-N**

Date: 03/11/2023 **Time: 12:00 pm to 03:00 pm** **Total Marks: 70**

Instructions:

1. Answer each section in separate answer sheet.
2. Use of scientific calculator is permitted.
3. All questions are Compulsory.
4. Indicate clearly, the option you attempt along with its respective question number.
5. Use the last page of main supplementary of rough work.

SECTION-I

Q-1 **(A)** (i). An objective way to compare two algorithms is by comparing their execution time irrespective of the machines. (True/False) **[5]**

(ii). The recursive versions of binary search use a _____strategy of designing an algorithm.

(iii). An O(log N) algorithm is slower than an O(N) algorithm. (True/False)

(iv). Which of the following is used for solving the N Queens Problem?

(1) Greedy Approach (2) Dynamic Approach

(3) Backtracking Approach (4) Branch-and-Bound Approach

(v). Which of the following sorting algorithms provide the best time complexity in the worst-case scenario?

(1) Merge Sort (2) Quick Sort (3) Selection Sort (4) Bubble Sort

(B) What do you mean by an Algorithm? Discuss the most common characteristics of an algorithm. **[5]**

(C) What is an Asymptotic notation? How is it important for analysis of an algorithm in terms of bounds? **[5]**

OR

(C) Write an algorithm of Bubble sort and derive it's average case time complexity. **[5]**

Q-2 **(A)** Solve the following recurrences using recurrence tree method. **[5]**

$T(n) = 3T(n/4) + C(n^2)$

(B) Sort the numbers: 5,3,8,1,44,16,30,7,2,9 using Quick sort method and write best, worst and average case time complexity. **[5]**

OR

Q-2 **(A)** Solve the following recurrences using Master Theorem method. **[5]**

(1) $T(n) = 8T(n/2) + 1000*n^2$

(2) $T(n) = 3T(n/2) + n*\log n$

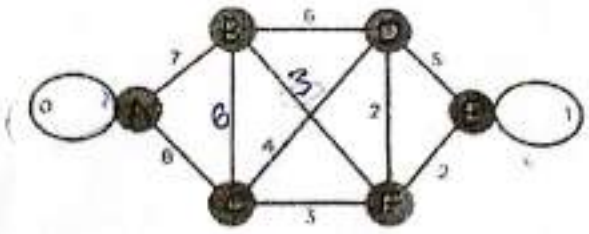
(B) Sort the given sequence: 132,543,049,222,007,063,254,555 by Radix Sort method. Also write best, worst and average case time complexity. **[5]**

Q-3 **(A)** What is MST? Explain Prim's algorithm with example for construction of MST. **[5]**

(B) What is Graph? Discuss the applications of Breadth-First Search and Depth-First Search. **[5]**

OR

Q-3 **(A)** Solve the following weighted graph using Kruskal's algorithm for the construction of MST. **[5]**



(B) Differentiate Breadth-First Search and Depth-First Search. **[5]**

Section-II

Q-4 **(A)** Define the following terms: (1) Directed Graph (2) Undirected Graph (3) Principal of Optimality (4) Power Set (5) Adjacency Matrix **[5]**

(B) Write algorithm for Binary Search Method. Also give the Time Complexity of Recursive Binary search algorithm in all cases. **[5]**

(C) Solve fractional-knapsack problem with capacity W=50, v[i]={60,100,120} and w[i]={10,20,30}. Calculate total profit and write selected weights. **[5]**

OR

(C) Find Longest Common Subsequence using dynamic programming for given sequences of characters. X={ALLIGNMENT} AND Y={ASSIGNMENT}. **[5]**

Q-5 **(A)** Differentiate Greedy Programming approach with Dynamic Programming approach. **[5]**

(B) Solve the following Activity Selection Problem using Greedy approach. **[5]**

Activity(A_n)	a1	a2	a3	a4	a5	a6	a7	a8
Start Time (S_i)	1	0	1	4	2	5	3	4
Finish Time (F_i)	3	4	2	6	9	8	5	5

OR

Q-5 **(A)** Give the difference between Divide-and-Conquer approach and Dynamic Programming approach. **[5]**

(B) Given the four matrices, find out minimum scalar multiplications and optimal sequence for multiplication P=<7,1,5,4,2> using Dynamic Programming. **[5]**

Q-6 **(A)** Define Backtracking Method. What is N-Queens Problem? Give solution of 4-Queens Problem using Backtracking Method. **[5]**

(B) Define and Explain Min-Max principle by an example. **[5]**

OR

Q-6 **(A)** Discuss P, NP, NP-Complete and NP-Hard Problem. **[5]**

(B) Write short note on Travelling Salesman Problem. **[5]**

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Seat No 225097

KADI SARVA VISHWAVIDYALAYA

B.E. CE/CSE SEMESTER – V (New) EXAMINATION NOVEMBER-2022

SUBJECT CODE: - CE504-N **SUBJECT NAME: - Design & Analysis of Algorithms**

DATE: - 10-Nov-2022 **TIME: - 10:00 am to 01:00 pm** **MARKS: -70**

Instructions:

1. Answer each section in separate Answer Sheet.
2. Use of scientific calculator is permitted.
3. All questions are **compulsory**.
4. Indicate clearly, the options you attempted along with its respective question number.
5. Use the last page of main supplementary for **rough work**.

SECTION – I

Q-1 A (i) The _____sort required to find minimum value and do the comparison with array. **[5]**

(ii) Problems that can be solved in polynomial time are known as_____.

(iii) Quick sort is not in-place algorithm. (True/ False)

(iv) _____ is the worst-case time complexity of the Merge sort algorithm.

(v) Matrix chain multiplication can be solved using brute force approach. (True/ False)

B How do you define the algorithm? What are the different of characteristics of an algorithm? **[5]**

C Write down the algorithm of Insertion sort and derive it's all cases time complexity. **[5]**

OR

C Write down the algorithm of Bubble sort and derive it's all cases time complexity. **[5]**

Q-2 A Write down the algorithm for Binary search and derive its time complexity using substitution method. **[5]**

B Explain Strasson's algorithm for matrix multiplication using an example. **[5]**

OR

Q-2 A Solve the below mentioned recurrence relation using Master Theorem? **[5]**

(i) $T(n) = 4T\left(\frac{n}{2}\right) + n^2$

(ii) $T(n) = 0.5T\left(\frac{n}{2}\right) + \frac{1}{n}$

B Sort the following sequence using Radix Sort. {11, 4, 333, 66, 7, 188, 55, 2, 114, 999} **[5]**

Q-3 A Explain Breadth First Search algorithm for Graph with example. **[5]**

B Differentiate between the Greedy Algorithm and Dynamic Programming. **[5]**

OR

Q-3 A Explain Depth First Search algorithm for Graph with example. **[5]**

B Compare Divide and Conquer Algorithm with Dynamic Programming. **[5]**

SECTION - II

Q-4 A Define following terms: (a) Time Complexity (b) Space Complexity (c) Directed Graph (d) Undirected Graph (e) Adjacency Matrix **[5]**

B Discuss the concepts of asymptotic notations with its types. **[5]**

C Find the MST of the figure 1 (below) using Prim's algorithm.

OR

C. Find the MST of the figure 1(below) using Kruskal's algorithm. **[5]**

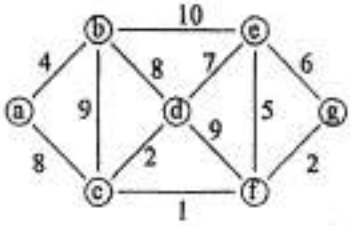

figure 1

Q-5 A Solve following activity selection problem with given data where S_i and F_i are the starting time and finishing time respectively. **[5]**

A	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11
S_i	1	3	0	5	3	5	6	8	8	2	12
F_i	6	5	9	7	4	9	10	13	11	16	14

B Solve the given fractional knapsack problem using greedy approach where W= 100 kg **[5]**

Item	i1	i2	i3	i4	i5
Weight(w)	10	20	30	40	50
Profit(v)	20	30	66	40	60

OR

Q-5 A Given two sequence of characters, X= { MLNOM }, Y = { MNOM } **[5]**
Obtain the longest common subsequence using dynamic programming.

B Solve following 0-1 knapsack problem using dynamic programming algorithm with given capacity W=6, Weight and Value are: (3,25), (2,20), (1,15), (4,40), (5,50). **[5]**

Q-6 A State and explain these principles: (i) Principle of Optimality (ii) Min-Max Principle **[5]**

B What is N-Queens Problem? Give solution of 4-Queens Problem using Backtracking Method. **[5]**

OR

Q-6 A Find out optimal sequence for multiplication: A1 [5 × 4], A2 [4 × 6], A3 [6 × 2], and A4 [2 × 7]. Also give the optimal parameterization of matrices. **[5]**

B Define the concept behind Branch-and-Bound algorithm? Explain job scheduling problem with Branch-and-Bound algorithm. **[5]**

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Enrollment No_____

KADI SARVA VISHWAVIDYALAYA

B.E. SEMESTER – V (New) REGULAR EXAMINATION NOVEMBER -2021

SUBJECT CODE: - CE504-N **SUBJECT NAME:- Design & Analysis of Algorithms**

DATE: - 22-Nov-2021 **TIME: - 10:00 am to 1:00 pm** **MARKS:-70 Marks**

Instructions:

1. Answer each section in separate Answer Sheet.
2. Use of scientific calculator is permitted.
3. All questions are **compulsory.**
4. Indicate clearly, the options you attempted along with its respective question number.
5. Use the last page of main supplementary for **rough work.**

SECTION - I

Q-1 A Explain why the analysis of algorithms is important? Explain worst case, best case and average case time complexity in details. [5]

B Define following terms: (i) Injective Function (ii) Optimal solution (iii) Space Complexity (iv) Linear Inequality (v) Principle of Optimality [5]

C Write down the algorithm of Bubble sort and derive it worst case time complexity. [5]

OR

C Sort the following data with Radix Sort: 98, 74, 32, 151, 27, 85, 66, 123, 13, 57, 3, 100 [5]

Q-2 A Solve the following recursive relation using Substitution Method: [5]

$$T(n) = \begin{cases} T(n-1) + c1, & other \\ c2, & n = 0 \end{cases}$$

B Write down the algorithm of Merge sort and sort the letters of word "EDUCATION" in alphabetical order using Merge Sort. [5]

OR

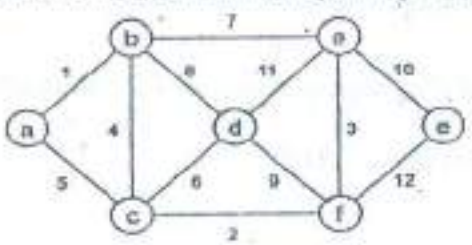
Q-2 A Solve the following recursive relation using Recurrence Tree Method: [5]

$$T(n) = \begin{cases} 2T(n/2) + cn, & n > 1 \\ c, & n = 1 \end{cases}$$

B Write down the algorithm of Quick sort and Trace the Quick Sort for the following data: 88, 22, 33, 44, 11, 55, 66, 99, 77 [5]

Q-3 A What is greedy algorithm and mention different application of greedy algorithm? [5]

B Apply Prim's Algorithm to find the Minimum Spanning Tree on the given graph: [5]

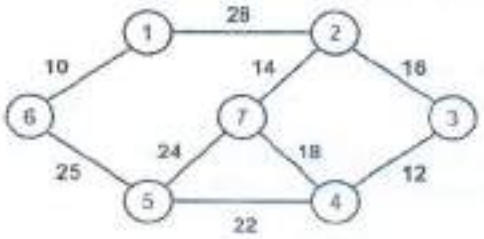


OR

Q-3 A Solve the following recursive relation using Master Theorem method [5]

(i) $T(n) = 9T\left(\frac{n}{3}\right) + n$ (ii) $T(n) = 2T\left(\frac{n}{2}\right) + \frac{n}{\log n}$

B Apply Kruskal's Algorithm to find the Minimum Spanning Tree on the given graph: [5]



SECTION - II

Q-4 A Define following terms: (i) Directed Graph (ii) Cycle Graph (iii) In-Degree (iv) Out-Degree (v) Adjacency Matrix [5]

B Write down Binary search algorithm. Also provide the analysis with example. [5]

C Given two sequence of characters, X={G,U,J,A,R,A,T}, Y = {J,R,A,T}, obtain the longest common subsequence. [5]

OR

C Solve following 0-1knapsack problem using dynamic programming algorithm with given capacity W=5, Weight and Value are as follows (W, V): (2, 12), (1, 10), (3, 20), (2, 15). [5]

Q-5 A Differentiate Greedy Algorithm with Dynamic Programming. [5]

B Solve the following Activity Selection Problem using greedy method: [5]

$Activity(a_n)$	a_1	a_2	a_3	a_4	a_5	a_6
$Start\ (s_i)$	5	1	3	0	5	8
$Finish\ (f_i)$	9	2	4	6	7	9

OR

A Define P, NP, NP Complete and NP-Hard Problem. [5]

B Find out optimal sequence for multiplication: A1 [5 × 4], A2 [4 × 6], A3 [6 × 2], and A4 [2 × 7]. Also give the optimal parenthesization of matrices [5]

Q-6 A Explain Backtracking Method. Give any one solution of 4-Queen problem using backtracking method. [5]

B List out the difference between BFS and DFS. [5]

OR

A Describe Min-Max Principle in details with example. [5]

B What is the concept behind Branch-and-Bound algorithm? Solve the below mention assignment problem using branch and bound technique [5]

Jobs

Person	IT	HR	BDA	FIN
A	9	2	7	8
B	6	4	3	7
C	5	8	1	8
D	7	6	9	4

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