

Enrollment No.....



Faculty of Science
End Sem Examination Dec-2023

BC3CO51 Design & Analysis of Algorithms

Programme: B.Sc.

Branch/Specialisation: Computer
Science**Duration: 3 Hrs.****Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

- Q.1 i. Which case indicate the minimum time required for program execution? **1**
 (a) Best case (b) Average case
 (c) Worst case (d) None of these
- ii. $O(\log n)$ is- **1**
 (a) Constant asymptotic notations
 (b) Logarithmic asymptotic notations
 (c) Polynomial asymptotic notations
 (d) Quadratic asymptotic notations
- iii. Which of the following sorting algorithms has a worst-case time complexity of $O(n^2)$? **1**
 (a) Merge sort (b) Heap sort
 (c) Quick sort (d) Bubble sort
- iv. What is the worst case time complexity of a quick sort algorithm? **1**
 (a) $O(N)$ (b) $O(N \log N)$ (c) $O(N^2)$ (d) $O(\log N)$
- v. Which of the following algorithms is used to find the minimum number of coins needed to make change for a given amount? **1**
 (a) Greedy algorithm
 (b) Depth First Search
 (c) Breadth First Search
 (d) Dijkstra's shortest path algorithm
- vi. What is the average number of comparisons used in a heap sort algorithm? **1**
 (a) $N \log N - O(N)$ (b) $O(N \log N) - O(N)$
 (c) $O(N \log N) - 1$ (d) $2N \log N + O(N)$

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- vii. In dynamic programming, the technique of storing the previously calculated values is called _____. **1**
 (a) Saving value property (b) Storing value property
 (c) Memoization (d) Mapping
- viii. Which of the following problems should be solved using dynamic programming? **1**
 (a) Merge sort (b) Binary search
 (c) Longest common subsequence (d) Quicksort
- ix. Backtracking algorithm is implemented by constructing a tree of choices called as? **1**
 (a) State-space tree (b) State-chart tree
 (c) Node tree (d) Backtracking tree
- x. In what manner is a state-space tree for a backtracking algorithm constructed? **1**
 (a) Depth-first search (b) Breadth-first search
 (c) Twice around the tree (d) Nearest neighbour first

- Q.2 i. What is an algorithm? Discuss its important characteristics. **2**
 ii. Explain string processing. **3**
 iii. Discuss the time and space complexity of an algorithm. Explain the notations used with example. **5**
- OR iv. Define searching. Explain linear search and binary search with example. **5**

- Q.3 i. Explain divide and conquer technique. **2**
 ii. Explain quick sort with example. Also write its worst case and best-case complexity. **8**
- OR iii. What is bucket sort? Write the difference between bucket sort and radix sort. **8**

- Q.4 i. Explain coin change problem. **3**
 ii. Construct Huffman code for the following data: **7**

Character	A	B	C	D	E
Probability	0.4	0.1	0.2	0.15	0.15

Decode the text whose ending 100010111001010 using above Huffman code.

- OR iii. Define heap? Explain heap sort by giving suitable example. **7**

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- Q.5 i. Write an algorithm to find an optimal binary search tree using dynamic programming. **4**
 ii. Define how knapsack problem is solved by dynamic programming. **6**
 Consider $n=3$ (w_1, w_2, w_3)=(2,3,3), (P_1, P_2, P_3)=(1,2,4) and $m=6$. Find optimal solution.
- OR iii. Explain travelling sales person problem with example. **6**
- Q.6 Attempt any two:
- i. Explain NP-Complete and NP-Hard problems. **5**
 ii. Explain 8-queen problem using backtracking. **5**
 iii. What is LC branch and bound solution? Explain. **5**

Scheme of Marking

Design and Analysis of Algorithm-BC3CO51(T)

Q.1	i)	A	1												
	ii)	B	1												
	iii)	D	1												
	iv)	C	1												
	v)	A	1												
	vi)	D	1												
	vii)	C	1												
	viii)	C	1												
	ix)	A	1												
	x)	A	1												
Q.2	i.	Definition and characteristics one mark each.	1,1												
	ii.	Explanation of String processing	3												
	iii.	Discuss the time and space complexity of an algorithm. Explain the notations used with example	2.5, 2.5												
	OR iv.	Define searching. Explain linear search and binary search with example.	2,3												
Q.3	i.	Explain Divide and Conquer technique.	2												
	ii.	Explain Quick sort with example. Also write its worst case and best-case complexity.	2,4,2												
OR	iii.	What is Bucket sort? Write the difference between bucket sort and radix sort.	2,6												
Q.4	i.	Explain Coin Change Problem.	3												
	ii.	Construct Huffman code for the following data:	7												
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OR	iii.	Define Heap? Explain heap sort by giving suitable example.	2,5												
Q.5	i.	Write an algorithm to find an Optimal Binary Search tree using dynamic programming.	4												

	ii.	Define how knapsack problem is solved by Dynamic programming. Consider $n=3$ (w_1, w_2, w_3)=(2,3,3), (P_1, P_2, P_3)=(1,2,4) and $m=6$. Find optimal solution.	6
	OR iii.	Write an algorithm to find an Optimal Binary Search tree using dynamic programming.	6
Q.6	i.	Explain NP-Complete and NP-Hard problems.	5
	ii.	Explain 8-queen problem using backtracking.	5
	iii.	What is LC Branch and Bound solution? Explain.	5
