QP CODE: 24803245

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Reg No : .....

Name : .....

I.M.C.A DEGREE EXAMINATION, MAY 2024

Seventh Semester

Integrated MCA

Core - IMCA7C02 - ANALYSIS AND DESIGN OF ALGORITHMS

2020 Admission Onwards

0DB3446E

Time: 3 Hours Maximum: 75 Marks

Part A

*Answer any **ten** questions*

*Each question carries **3** marks*

1. Imagine you're tasked with finding a specific book in a giant library with millions of books arranged alphabetically by genre.Which design strategies might be suitable for this task, and why?
2. What practical difficulties do algorithm designers face when calculating the best-case, average-case, and worst-case time complexities of algorithms?
3. List and briefly explain any three prominent algorithms that are based on the divide-and-conquer programming paradigm.
4. Merge Sort is not an in-place sorting algorithm. Explain why this is the case and discuss the space complexity of Merge Sort.
5. What are the limitations of Strassen's algorithm compared to traditional matrix multiplication?
6. How does the Greedy Method make decisions at each step of the problem-solving process?
7. What is the Greedy Strategy used in Prim's Algorithm?
8. List the features of dynamic programming.
9. Explain Branch and bound technique.
10. Apply branch and bound to 0/1 knapsack problem and elaborate it.
11. What do you mean by P,NP,NP-Hard and NP-Complete Problems? Give an example of each category.

12. Explain the satisifiability problem and write the algorithm.

(10×3=30 marks)

Part B

*Answer **all** questions*

*Each question carries **9** marks*

13. a) Describe the role of algorithmic paradigms such as divide and conquer, dynamic programming, and greedy algorithms in algorithm analysis and design. Provide examples illustrating the application of each paradigm in solving real-world problems.

OR

b) Compare and contrast the different types of time complexity analyses, including worst-case, best-case, and average-case scenarios. How do these analyses provide insights into the behavior of algorithms under varying input conditions?

14. a) Using the Merge Sort algorithm, demonstrate the step-by-step process of sorting the following array: 14, 7, 3, 12, 9, 11, 6, 12.Additionally, analyze the time complexity of the Merge Sort algorithm in this specific example.

OR

b) Using the Quick Sort algorithm, sort the array {21, 10, 7, 15, 1219, 2, 5} step by step.Provide a detailed explanation of each step, demonstrating how the array evolves with each partitioning iteration until the array is fully sorted.

15. a) Explain the Greedy Method as a problem-solving approach in algorithm design, focusing on its general methodology, characteristics, advantages, limitations, and applications.

OR

b) Explain travelling sales man problem with an example by using dynamic programming.

16. a) Write a backtracking algorithm for the sum of subsets problem using the state space tree corresponding to the variable tuple size formulation

OR

b) What is LC Search ? Explain in details in Control abstraction for LC Search.

17. a) Using an example prove that, satisfiability of Boolean formula in 3 conjunctive normal form in NP-complete.

OR

b) Write Short notes on non-deterministic search and sort.

(5×9=45 marks)