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Fourth Semester B.E. Degree Examination, June/July 2024 Design and Analysis of Algorithms

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define algorithm. Explain the following asymptotic notations:
 i) Big On ii) Big Omega iii) Big Theta (08 Marks)
 b. Design a non-recursive algorithm to find maximum element in an array of n elements. Give the Mathematical Analysis. (08 Marks)
 c. Define time and space complexity. (04 Marks)

OR

- 2 a. Design an algorithm for performing sequential search and compute Best, Worst and Average case efficiency. (08 Marks)
 b. Write an algorithm to find the uniqueness of element an array and give mathematical analysis of this non recursive algorithm with steps. (08 Marks)
 c. List and explain basic asymptotic efficiency classes. (04 Marks)

Module-2

- 3 a. Illustrate the tracing of the Quick Sort algorithm for the following set of numbers
 5, 3, 1, 9, 8, 2, 4, 7 (10 Marks)
 b. Apply the topological sorting algorithm for the following graph shown in Fig.Q3(b). Find the topological sequence.

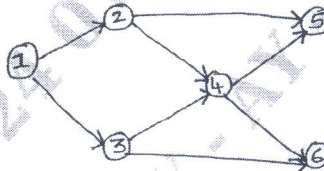


Fig.Q3(b)

(10 Marks)

OR

- 4 a. Write a C++/JAVA program for Merge Sort. Analyze its efficiency and apply the same to sort the following numbers : 4, 9, 0, -1, 6, 8, 9, 2, 3, 12. (10 Marks)
 b. Write a recursive algorithm for Binary Search and also bring out its efficiency. (10 Marks)

Module-3

- 5 a. Apply greedy method to obtain an optimal solution to the knapsack problem given M = 60.
 W = {5, 10, 20, 30, 40}
 P = {30, 20, 100, 90, 160}
 Find total profit earned. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- b. Apply single source shortest path algorithm to the following graph Fig.Q5(b). Assume vertex 'a' as source.

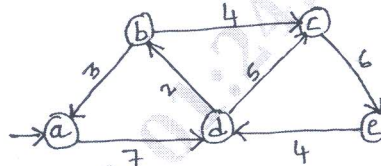


Fig.Q5(b)

(10 Marks)

OR

- 6 a. A message consisting of the character given in the table below has to be transmitted network in a secured manner.

Character	A	M	R	-
Probability	0.4	0.2	0.3	0.1

- i) Construct Huffman tree
- ii) Device Huffman codes for the given characters
- iii) Encode the text : RAMA RAMAR
- iv) Decode the text : 1000101

(10 Marks)

- b. Find the optimal solution using greedy for the job sequencing with dead line problem with following values:

Job	J ₁	J ₂	J ₃	J ₄	J ₅
Profit	10	3	33	11	40
Dead line	3	1	1	2	2

(10 Marks)

Module-4

- 7 a. Define a Multistage Graph. Give an example. Explain the technique of finding the minimum cost path in a multistage graph. (10 Marks)
- b. Write Floyd's Algorithm and find all pair Shortest path for the given graph. [Refer Fig.Q7(b)]

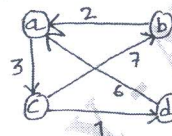


Fig.Q7(b)

(10 Marks)

OR

- 8 a. Apply the Dynamic Programming to solve travelling sales person problem for the following graph shown in Fig.Q8(a).

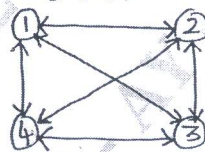


Fig.Q8(a)

C	1	2	3	4
1	0	10	15	20
2	5	0	9	10
3	6	13	0	12
4	8	8	9	0

(10 Marks)

- b. Write Horspool Algorithm for string matching. Trace the algorithm to find the pattern "ELECTION" in the text.

"EDUCATION ONLY HELPS IN SELECTION."

(10 Marks)

Module-5

- 9 a. Construct the state-space tree for sum of subset problem given the following data:
 $W = \{3, 5, 6, 7\}$ and $m = 15$. (10 Marks)
- b. Write C++ / JAVA program to find all Hamiltonian cycles in a connected undirected Graph G of n vertices using backtracking principle. (10 Marks)

OR

- 10 a. Explain Branch and Bound concept. Apply Branch and Bound to the following instance of assignment problem.

	Job1	Job2	Job3	Job4
Person A	9	2	7	8
Person B	6	4	3	7
Person C	5	8	1	8
Person D	7	6	9	4

- b. Explain the following concepts : (10 Marks)
- Graph coloring problem with an example
 - NP Complete Problem
 - NP-Hard Class Problem
- (10 Marks)
