CBCS SCHEME

USN | | | | | | | | | | |

21CS42

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.

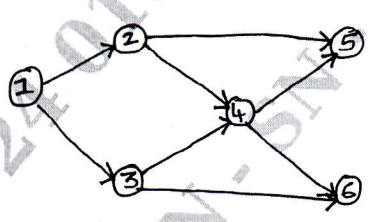

Fig.Q3(b) **(10 Marks)**

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)**

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

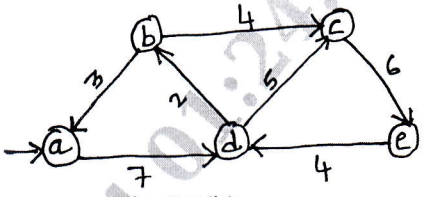

Fig.Q5(b) **(10 Marks)**

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)]

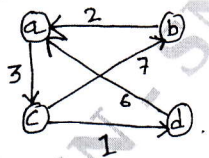

Fig.Q7(b) **(10 Marks)**

OR

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

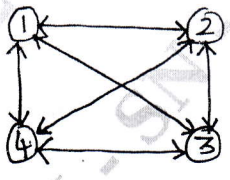

Fig.Q8(a)

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

(10 Marks)

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

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