

# CBCS SCHEME



21CS42

## Fourth Semester B.E. Degree Examination, June/July 2023 Design & Analysis of Algorithms

Time: 3 hrs.

Max. Marks: 100

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

### Module-1

- a. Explain the algorithm design and analysis process in detail. (10 Marks)  
b. Explain the asymptotic narrations with example. (10 Marks)

OR

- a. Explain the general plan of mathematical analysis of recursive algorithm with example. (10 Marks)  
b. Design an algorithm to search an element in an array using sequential search. Discuss the Best-case, worst-case and average-case efficiency of this algorithm. (10 Marks)

### Module-2

- a. Explain the concept of Divide and Conquer. Write the recursive algorithm to perform Binary search on the list of elements. (10 Marks)  
b. Apply Quick sort algorithm to sort the list of characters : P, R, O, G, R, A, M, M, I, N, G. Draw the tree of recursive calls made while tracing. (10 Marks)

OR

- a. Develop a recursive algorithm to find the minimum and maximum element from the list. Illustrate with an example. (10 Marks)  
b. Define Topological sorting. Illustrate the topological sorting for the following graph:

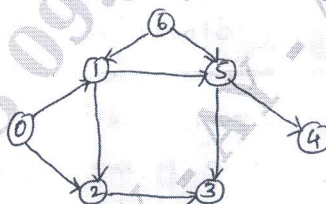


Fig. Q4 (b)

(10 Marks)

### Module-3

- a. Solve the following instance of greedy knapsack problem where  $n = 4$ ,  $m = 10$ ,  $p = \{40, 42, 25, 12\}$  and  $w = \{4, 7, 5, 3\}$ . (10 Marks)  
b. Apply Dijkstra's algorithm to find single source shortest path for the given graph by considering 'S' as the source vertex. (10 Marks)

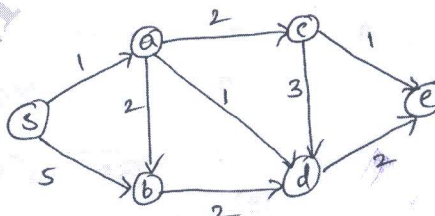


Fig. Q5 (b)

OR

- 6 a. Construct a Huffman Tree and resulting code word for the following :

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

Encode the text ABACABAD and Decode the text 100010111001010.

(10 Marks)

- b. Write a C++/Java program to find minimum cost spanning tree of a given connected graph using Kruskal's algorithm. Use Union-Find algorithm in your program. (10 Marks)

**Module-4**

- 7 a. Find a minimum-cost path from S to T in the given multistage graph.

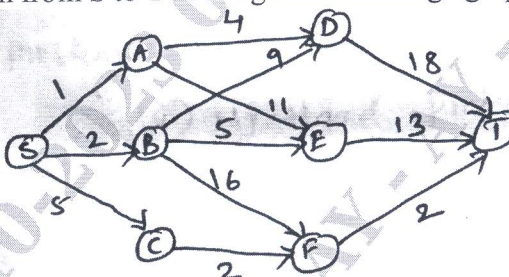


Fig. Q7 (a)

(10 Marks)

- b. Write Floyd's algorithm and apply the same to trace the following graph.

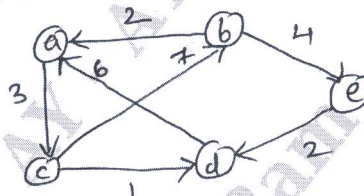


Fig. Q7 (b)

(10 Marks)

OR

- 8 a. Write Horspool's algorithm for string matching. Find the pattern BARBER. In the text : JIM\_SAW\_ME\_IN\_A\_BARBERSHOP. (10 Marks)  
 b. Write a C++/Java program to solve 0/1 knapsack problem using Dynamic programming method. (10 Marks)

**Module-5**

- 9 a. Differentiate between Back tracking and Branch and Bound technique. Apply back tracking to solve the following instance of the subset-sum problem :  $S = \{1, 2, 3, 6, 8\}$ ,  $d = 9$ . (10 Marks)  
 b. Solve the following assignment problem using branch and bound method. (10 Marks)

	Job 1	Job 2	Job 3	Job 4
Person a	9	2	7	8
Person b	6	4	3	7
Person c	5	8	1	8
Person d	7	6	9	4

OR

- 10 a. Explain the following with examples :  
 (i) P problems (ii) NP problems  
 (iii) NP-complete problems (iv) NP-Hard problems (10 Marks)  
 b. Design and implement C++/Java program to find all Hamiltonian cycles in a connected undirected graph G of n vertices using back tracking principle. (10 Marks)

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