

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

Max. Marks: 100

Time: 3 hrs.

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

Module-1

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

OR

- 2 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

- 3 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

- 4 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:

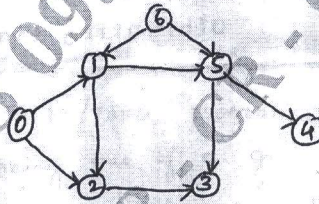


Fig. Q4 (b)

(10 Marks)

Module-3

- 5 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)

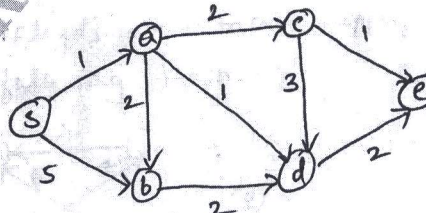


Fig. Q5 (b)

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.

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.

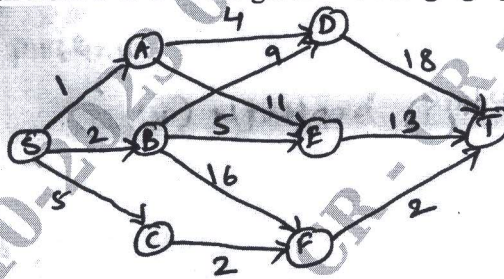


Fig. Q7 (a)

(10 Marks)

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

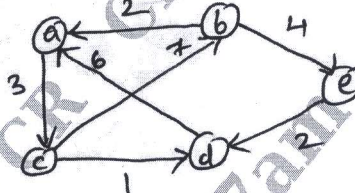


Fig. Q7 (b)

(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)
