CBCS SCHEME

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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

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:

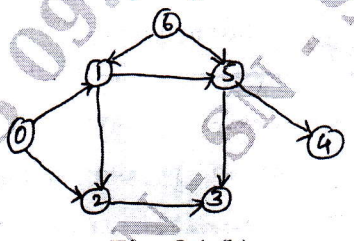

Fig. Q4 (b) **(10 Marks)**

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)**

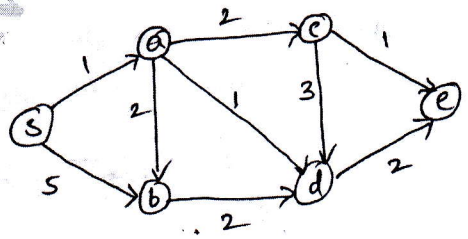

Fig. Q5 (b)

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.

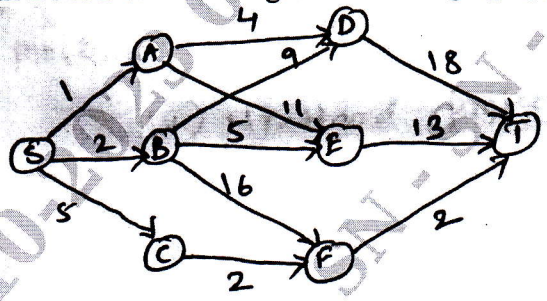

Fig. Q7 (a) **(10 Marks)**

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

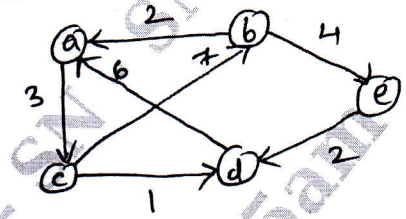

Fig.Q7 (b) **(10 Marks)**

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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