

5 Years Integrated MCA, Utkal University

End Semester Examination, 2021

Semester: 7<sup>th</sup>

Sub: DAA (7.3)

Full Mark:70

Time: 2 Hours

Answer all Questions

1. a) What is time complexity of an algorithm? Let  $f(n) = 2n^3 + 4n + 8$ . Find the O,  $\Omega$ ,  $\theta$ , o, w notation for the function. 7
- b) What is max heap? What are its properties? Write the algorithm to heapify the max heap. 7

OR

- c) Explain the Rabin-Karp string matching algorithm. 7
- d) Solve the recurrence  $T(n) = 3T\left(\frac{n}{4}\right) + n^2$  using Recursion Tree method. 7
2. a) Write the algorithm to sort an array of unsorted elements using Quick Sort and find its worst case time complexity. Determine the partitioning position of the given array of elements using Quick sort. 14

24, 16, 86, 32, 64, 15, 22, 35, 53

OR

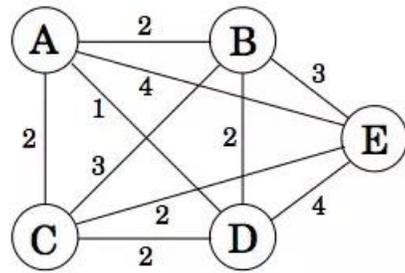
- b) Explain the heap sort algorithm to sort an array of elements with its time complexity. Sort the given list of elements using heap sort. 14
- 24, 16, 86, 32, 64, 15, 22, 35, 53
3. a) What is greedy choice property? Write the greedy algorithm to solve the fractional knapsack problem. Find an optimal solution to the knapsack instance  $n = 7$ ,  $m = 15$ ,  $(p_1, p_2, p_3, p_4, p_5, p_6, p_7) = (10, 5, 15, 7, 6, 18, 3)$ , and  $(w_1, w_2, w_3, w_4, w_5, w_6, w_7) = (2, 3, 5, 7, 1, 4, 1)$  using greedy technique. 10

- b) Solve the following activity selection problem for the following set of activities using greedy approach. 4

Start time	5	1	3	0	5	8	5
Finish time	9	2	4	6	7	9	12

OR

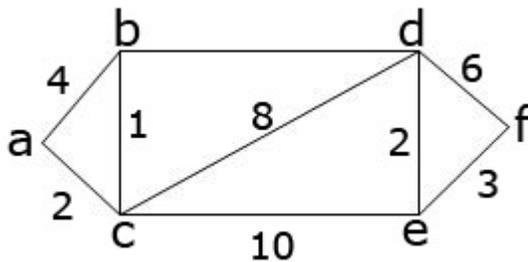
- c) Explain the dynamic programming algorithm to solve the Traveling Salesman Problem. Find the optimal tour for the given graph considering A as the source using dynamic programming approach. 14



4. a) What is MST problem? Write the Kruskal's algorithm to determine the Minimum Spanning tree and use Kruskal's and Prim's algorithm in the graph in Q. 3- (C) to find out the MST. 14

OR

- b) Write the Dijkstra's algorithm to solve the single source shortest path problem and determine the shortest path from vertex 'a' to all other vertices using this algorithm. 14



5. a) What is approximation algorithm? Explain the approximation algorithm for Travelling Salesman problem with an example. 10
- b) Define Class NP-Complete problems. Write the steps to prove that a problem is NP-Complete. 4

OR

- c) Let  $X = "110110"$  and  $Y = "01010"$  be the two sequences. Determine the Longest Common Subsequence of X and Y using Dynamic programming approach. 7
- d) Construct the Hoffman Tree for the following characters when their frequencies are given. 7

Character	L	M	N	A	B	P	D
Frequency	6	16	52	18	20	32	60