

Question Paper

Exam Date & Time: 20-Jul-2022 (02:00 PM - 05:00 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

FOURTH SEMESTER B.TECH MAKEUP EXAMINATIONS, JULY 2022

DESIGN AND ANALYSIS OF ALGORITHMS [CSE 2252]

Marks: 50

Duration: 180 mins.

Answer all the questions.

- 1) List the general plan for analyzing time efficiency of recursive algorithms. Set up and solve the recurrence relation for the number of moves made by Tower of Hanoi algorithm using backward substitution method (3)
- A) (3)
- B) Write an algorithm for bubble sort and analyse the same. Trace it to sort the list E, X, A, M, P, L, E in alphabetical order. (4)
- C) For the graph shown in Fig. 3, starting at vertex 'a' and resolving ties by the vertex alphabetical order, traverse the graph by depth-first search and construct the corresponding depth-first search tree. Give the order in which the vertices were reached for the first time (pushed onto the traversal stack) and the order in which the vertices became dead ends (popped off the stack). (3)

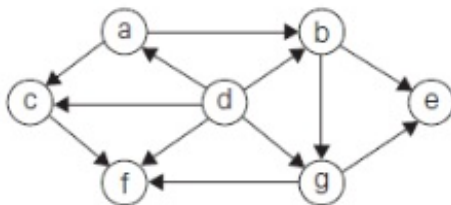


Fig. 3.

- 2) Explain the fundamental steps in algorithm design and analysis process with a neat diagram (2)
- A) (2)
- B) Write the different variations of Decrease and Conquer with an example for each. (4)
- C) Write the properties of AVL trees and give the best-case and worst-case efficiency for the same. (4)
Construct AVL tree for the given list of elements- 20, 11, 5, 32, 40, 2, 4, 27, 23, 28, 50. Clearly show all the steps involved.
- 3) Write the general working of quicksort algorithm. Show the tracing for the input: (5)
- A) **E, X, A, M, P, L, E** and also give the tree of recursive calls. (3)
- B) Perform string matching using Boyer - Moore technique for the text: **GTTATAGCTGATCGCGGCGTAGCGGCGAA** and pattern: **GTAGCGGCG** (3)
- C) Construct 2-3 tree for the letters **A, L, G, O, R, I, T, H, M, S** using successive insertions. (2)

- 4) Construct a Max Heap for the array $A = \{4, 1, 3, 2, 16, 9, 10, 14, 8, 7\}$ using bottom up and perform heapsort. (4)

A)

- B) For the input **12, 44, 67, 22, 58, 64, 52, 89** and hash function $h(x) = \{(x+i^2) \bmod 10\}$ where $0 \leq i \leq 9$ and x is the input element. (3)

i) Construct the closed hash table.

ii) What is load factor?

- C) Apply the bottom-up dynamic programming algorithm to the instance of the knapsack problem given in table 12, with capacity $W = 5$ (3)

item	weight	value
1	2	\$12
2	1	\$10
3	3	\$20
4	2	\$15

Table 12

- 5) i) Construct the Huffman tree and obtain the Huffman code for the data given in table 13 (5)

A)

Symbol	A	E	H	S	W
Frequency	0.2	0.2	0.15	0.3	0.15

Table 13

ii) Decode 11100011100101110100 using the code obtained in (a)

iii) Compute the compression ratio

- B) Compare Prim's, Krushkal's, and Dijkstra's algorithms (3)

- C) Give real life application of Prim's and Krushkal's algorithms (2)

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