

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-III (NEW) EXAMINATION – SUMMER 2024

Subject Code:3130702

Date:19-07-2024

Subject Name: Data Structures

Time:10:30 AM TO 01:00 PM

Total Marks:70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

MARKS

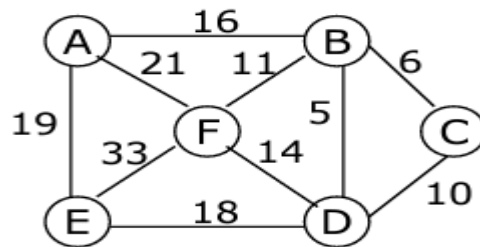
- Q.1**
- | | | |
|-----|---|-----------|
| (a) | Explain data structure. Enlist and explain the importance of data structure. | 03 |
| (b) | Define time and space complexity. Derive time complexity of merge sort. | 04 |
| (c) | 1) Evaluate the postfix expression in tabular forms: $2\ 5\ 3\ -\ * \ 8\ / \ 4\ +$ | 03 |
| | 2) Evaluate the prefix expression in tabular forms: $/ \ 7 \ * \ 1 \ + \ 4 \ - \ 6 \ 3$ | 04 |

- Q.2**
- | | | |
|-----|---|-----------|
| (a) | Explain Tower of Hanoi with suitable example. | 03 |
| (b) | Define hash function. Explain it with suitable example. | 04 |
| (c) | Write an algorithm for the following stack operations.
1) PUSH 2) POP 3) DISPLAY | 07 |

OR

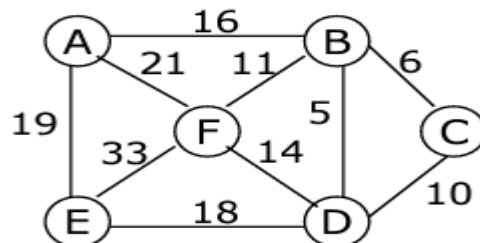
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|-----|--|-----------|
| (c) | Write an algorithm for the following queue operations.
1) INSERT 2) DELETE 3) DISPLAY | 07 |
|-----|--|-----------|

- Q.3**
- | | | |
|-----|---|-----------|
| (a) | Write an algorithm to add a node into a binary search tree. | 03 |
| (b) | Explain Dequeue and Priority queue in detail. | 04 |
| (c) | Construct the minimum spanning tree using prim's algorithm for the following graph. | 07 |



OR

- Q.3**
- | | | |
|-----|---|-----------|
| (a) | Write an algorithm to delete an item from the doubly linked list. | 03 |
| (b) | Differentiate: BFS and DFS. | 04 |
| (c) | Construct the minimum spanning tree using krushkal's algorithm for the following graph. | 07 |



- Q.4** (a) Define the terms below: **03**
1) Threaded Tree 2) Acyclic graph 3) Sparse matrix
- (b) Explain AVL tree in detail with suitable example. **04**
- (c) Construct a binary tree from the traversals given below: **07**
Inorder : D, B, E, H, A, I, F, C, G
Preorder : A, B, D, E, H, C, F, I, G

OR

- Q.4** (a) Define the terms below: **03**
1) Complete Binary Tree 2) Forest 3) Abstract data type
- (b) Explain 2-3 tree in brief. **04**
- (c) Write an algorithm to insert an item as below: **07**
1) At the start of the linked list
2) At the end of the linked list

- Q.5** (a) Define file. Explain its types. **03**
- (b) Explain bubble sort with suitable example. **04**
- (c) Build a chained hash table of 10 memory locations. Insert the keys 121, 3, 4, 31, 61, 24, 7, 87, 8, 9 in hash table using chaining. Use $h(k) = k \text{ mod } m$ ($m=10$). **07**

OR

- Q.5** (a) Define file organization. Explain different file organizations. **03**
- (b) Sort the following array elements using insertion sort algorithm. **04**
8, -2, 5, 3, 9, 4, 6
- (c) Explain Dijkstra's shortest path using suitable example. **07**
