PAPER ID-421810

Subject Code: RCS405

Roll No: | | | | | | | | | | | | | |

# BTECH
## (SEM IV) THEORY EXAMINATION 2021-22
## DATA STRUCTURE

***Time: 3 Hours*** ***Total Marks: 70***

**Note:** Attempt all Sections. If require any missing data; then choose suitably.

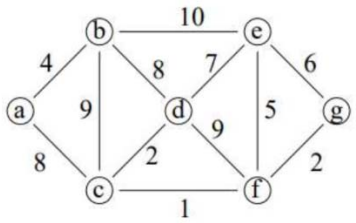
## SECTION A

**1. Attempt *all* questions in brief.** **2x7 = 14**

| | |
|---|---|
| a. | Define Abstract Data Types with example. |
| b. | Suppose the following list of keys are inserted into empty binary search tree. Draw the resulting tree.<br>20, 10, 18, 4, 8, 5, 13, 16, 17, 1, 27. |
| c. | Explain the working of Bubble sort with suitable example. |
| d. | Differentiate between underflow and overflow conditions in a stack. |
| e. | Define complete binary tree and full binary tree. |
| f. | List the advantage of AVL tree over BST. |
| g. | What are the disadvantages of binary tree representation using array? |

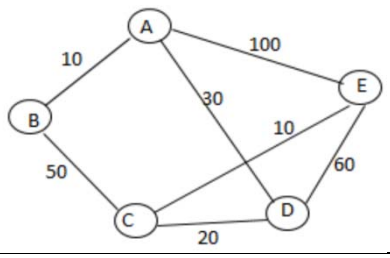
## SECTION B

**2. Attempt any *three* of the following:** **7x3 = 21**

| | |
|---|---|
| a. | Apply the Prim's algorithm to the following graph to determine the minimal spanning tree.<br>  |
| b. | Define the term Data Structure. List some linear and non-linear data structures stating the application area where they can be used. |
| c. | Associate the concept of polynomial representation with Linked List by giving a suitable example. |
| d. | Write an algorithm for binary search. Explain why binary search is better than linear search? |
| e. | Write a recursive C program to print Fibonacci series up to $n^{th}$ term. |

## SECTION C

**3. Attempt any *one* part of the following:** **7x1 = 7**

| | |
|---|---|
| a. | Draw a binary tree with following traversals:<br>In-order: H D B I E A F J C K G L<br>Post-order: H D I E B J F K L G C A |
| b. | Describe Dijkstra's algorithm for finding shortest path. Describe its working for the graph given below.<br>  |

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**4. Attempt any *one* part of the following: 7x1 = 7**

| | |
|---|---|
| a. | Apply the process of B-tree (order-3) construction on following sequence of inputs. 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110 |
| b. | What is doubly linked list? Write an algorithm to insert a node at begin in single linked list. |

**5. Attempt any *one* part of the following: 7x1 = 7**

| | |
|---|---|
| a. | What do you understand by time-space trade off? Discuss about asymptotic notations in detail. |
| b. | Suppose we have a singly linked list with START pointer pointing to the first node of this list and next pointer of last node is NULL. Write a function in C to delete the last node of the list and return the START pointer of the updated list. |

**6. Attempt any *one* part of the following: 7x1 = 7**

| | |
|---|---|
| a. | Analyze the worst case of Quicksort algorithm. Apply the quicksort algorithm and show each iteration of the algorithm on the following sequence; 45, 62, 25, 68, 23, 42, 24, 67, 12, 55 |
| b. | Illustrate and analyze the algorithm of Merge sort. Show each step of applying merge sort on the following sequence; 45, 62, 25, 68, 23, 42, 24, 67, 12, 55 |

**7. Attempt any *one* part of the following: 7x1 = 7**

| | |
|---|---|
| a. | Use the following traversals and show step-by-step construction of the corresponding Binary tree.<br>In-order: **QBKCFAGPEDHR**<br>Pre-order: **GBQACKFPDERH**<br>Also write down the post-order traversal of the constructed binary tree. |
| b. | Evaluate the differences between BST and B-tree by designing these trees using a suitable example sequence of different keys. |