

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
Third Semester B.Tech Degree Examination December 2020 (2019 Scheme)

**Course Code: CST201**  
**Course Name: DATA STRUCTURES**

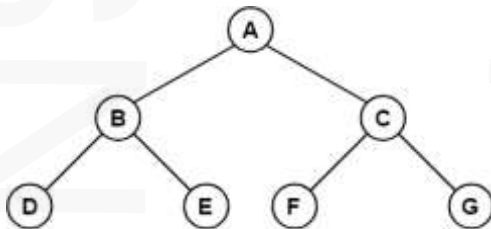
Max. Marks: 100

Duration: 3 Hours

**PART A***Answer all questions. Each question carries 3 marks*

Marks

- |   |  |     |
|---|--|-----|
| 1 | What is frequency count? Explain with an example.  | (3) |
| 2 | Derive the Big O notation for $f(n) = 3n^3 + 2n + 7$ .                                   | (3) |
| 3 | Write any three applications of Stack.   | (3) |
| 4 | Explain PUSH and POP operations in stack.  | (3) |
| 5 | What is dynamic memory allocation? List any two advantages of dynamic memory allocation. | (3) |
| 6 | Write an algorithm to count number of nodes in a singly linked list.                     | (3) |
| 7 | Write the output of inorder, preorder & postorder traversals on the following tree.      | (3) |



- |    |  |     |
|----|--|-----|
| 8  | Differentiate between complete binary tree and full binary tree. Give examples for each. | (3) |
| 9  | Explain Max Heap with an example.  | (3) |
| 10 | What is hashing? List any two applications of hashing.                                   | (3) |

**PART B***Answer any one full question from each module. Each question carries 14 marks***Module 1**

- |       |   |      |
|-------|---|------|
| 11 a) | Explain the System Life Cycle in detail.      | (10) |
| b)    | What are asymptotic notations? Give examples. | (4)  |

## 0800CST201122005

- 12 a) How the performance of an algorithm is evaluated? Explain the best, worst and average case analysis of an algorithm with the help of an example. (10)
- b) What is the difference between algorithm and pseudocode? (4)

### Module 2

- 13 a) What is sparse matrix? Write an algorithm to add two sparse matrices. (10)
- b) Write an algorithm to insert an element to a circular queue using array. (4)
- 14 a) Convert  $P*(Q+R)/S$  to postfix notation. Write algorithm and step-by-step conversion using the stack. (10)
- b) Write an algorithm to search an element using binary search. Discuss its time complexity. (4)

### Module 3

- 15 a) Write an algorithm to insert a node in the beginning and end of a doubly linked list. Demonstrate with an example. (10)
- b) Explain the advantages and disadvantages of First-fit and Best-fit memory allocation schemes. (4)
- 16 a) How can a linked list used to represent the polynomial  $3x^4+2x^2+5$ . Write an algorithm to add two polynomials represented using linked list. (10)
- b) Write an algorithm to delete a given node in a singly linked list. (4)

### Module 4

- 17 a) Write an algorithm to insert an element to a binary search tree. Explain with an example. (10)
- b) Explain any two graph representation methods with example for each. (4)
- 18 a) Write algorithm to perform DFS in a graph. Explain with an example. (10)
- b) Show the structure of the binary search tree after adding each of the following values in that order: 2, 5, 1, 7, 10, 9, 11, 6. What is the height of the created tree? (4)

### Module 5

- 19 a) Explain Quick sort algorithm with an example. (10)
- b) What is meant by collision? Give an example. (4)
- 20 a) Explain the four different hashing functions with examples. (8)
- b) Illustrate the differences between selection sort and insertion sort with example. (6)

\*\*\*

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

Third Semester B.Tech Degree Regular and Supplementary Examination December 2022 (2019 Scheme)

**Course Code: CST201****Course Name: DATA STRUCTURES**

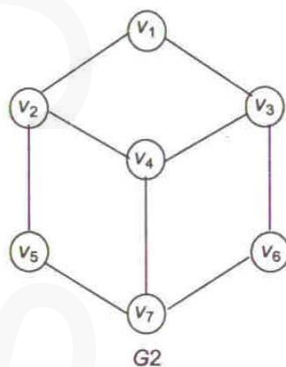
Max. Marks: 100

Duration: 3 Hours

**PART A***Answer all questions. Each question carries 3 marks*

Marks

- 1 Compute the time complexity of linear search algorithm using frequency count method (3)
- 2 Explain space complexity (3)
- 3 Represent the polynomial  $P(X,Y) = 10X^7Y^7 + 5X^6Y^5 + 4X^4Y^2 + 8X^2 + 25$  using array of structures. (3)
- 4 Convert the expression  $A + B * C - D / E * H$  to postfix form. Show each step in the conversion including the stack contents (3)
- 5 Explain self-referential structure with an example. Give any one use of self-referential structure. (3)
- 6 Write an algorithm /pseudocode to count the number of nodes in a singly linked list (3)
- 7 Explain BST and its properties. Give an example (3)
- 8 Express the adjacency matrix and the adjacency list representation of the graph (3)



- 9 Write the insertion sort algorithm (3)
- 10 Explain any two commonly used hash functions (3)

**PART B**

*Answer any one full question from each module. Each question carries 14 marks*

**Module 1**

- 11 a Explain various asymptotic notations used in analysis of algorithm (9)
- b Calculate the frequency count of the statement  $x = x+1$ ; in the following code segment (5)
- ```

for (i = 0; i < n; i++)
    for (j = 0; j < n; j++)
        x = x + 1;

```
- 12 a Explain System life cycle in detail (8)
- b What do you mean by Time complexity of an algorithm? Derive the Big O notation for the function  $f(n) = n^2+3n+2$  (6)

**Module 2**

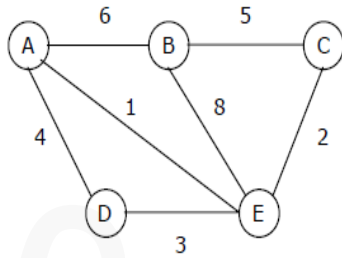
- 13 a Write the binary search algorithms and demonstrate it with an example. (8)
- b Explain the data Structure Stack in detail. Display the status of a stack with maximum capacity 5.on the following operations (in order ) on it. (6)
- Pop( ), Push(5), push(4), Pop( ), Push(9)
- 14 a Write the algorithm to evaluate Postfix expression and show each steps in the evaluation of the expression:  $2\ 3 + 8 - 5 *$  (8)
- b What do you mean by circular queue? Write algorithms to insert and delete elements on circular queue. (6)

**Module 3**

- 15 a What are the advantages of linked list over arrays? Write algorithms to implement Queue using linked list (8)
- b Given five memory partitions of 300Kb, 700Kb, 400Kb, 500Kb, 800Kb (in order), how would the first-fit, best-fit, and worst-fit algorithms place processes of 412 Kb, 617 Kb, 112 Kb, and 626 Kb (in order)? (6)
- 16 a Write polynomial addition algorithm using linked list and illustrate with an example (10)
- b Compare singly linked list and doubly linked list (4)

**Module 4**

- 17 Write Breadth First Search algorithm and illustrate it on the below graph . (8)



- b How to represent a binary tree using Arrays ? Construct a binary tree from the following elements arranged in an array A[1:15] as: (6)

|   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| A | B | C | D |   |   | E |   |   | F  |    | G  | H  |    |    |

- 18 a What do you mean by a BST?. Write an algorithm to remove an element from a Binary Search Tree. Demonstrate each case with an example (10)
- b Compare complete binary tree and full binary tree (4)

**Module 5**

- 19 a Write Merge Sort algorithm and demonstrate it to sort the list {12, 65, 34, 9, 56, 43, 10} in ascending order. (10)
- b Explain MAX HEAP with an example (4)
- 20 a Explain various collision resolution techniques in Hashing (8)
- b Hash the following keys using open chaining method and closed linear probing method. Size of table is 7 and the Hash function  $H(K) = K \text{ mod } 7$ . (6)
- Keys = {16, 21, 23, 50, 19, 26}

\*\*\*\*\*