

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**

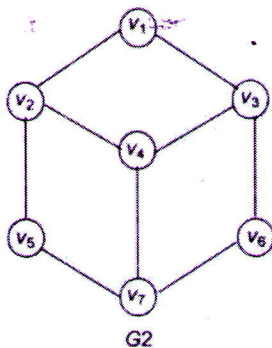
Max. Marks: 100

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**

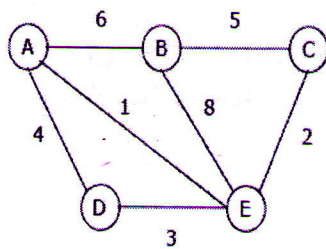
- 13 a Write the binary search algorithms and demonstrate it with an example. (8)
- b Explain the data Structure Stack in detail. Display the status of a stack with maximum capacity 5 on the following operations (in order) on it. (6)
- Pop( ), Push(5), push(4), Pop( ), Push(9)
- 14 a Write the algorithm 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  $H(K) = K \bmod 7$ . (6)
- Keys = {16, 21, 23, 50, 19, 26}

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