Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S3 (R,S) / S3 (WP) (R,S) / S1 (PT) (S,FE) Examination November 2024 (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? Compute the frequency count of the following code fragment (3)

```
for(i=0;i<n;i++)
    for(i=0;i<n;i++)
        C[i][j] =A[i][j] + B[i][j];
```

2 Derive Big O notation for $f(n)=5n^3+n^2+6n+2$ (3)

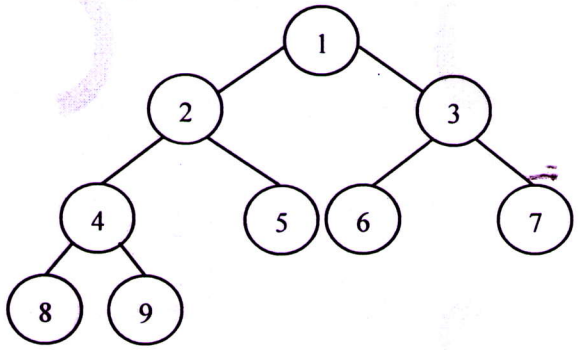
3 Convert the infix expression(A+B)*C-(D*E)-(F+G) into Postfix form and show the conversion steps using stack. (3)

4 Given a matrix having 8 rows and 8 columns and 8 non-zero elements. How much space can be saved by representing the matrix in sparse (tuple) form? (3)

5 Write an algorithm for deleting a node from a specified position of a circular linked list. (3)

6 Why do we need a self-referential structure? Give an example for self-referential structure? (3)

7 What is the output obtained after inorder, preorder and postorder traversal of the following tree? (3)



8 List any three applications of graphs. (3)

9 Perform selection sort on an array with values [34,12,56,29,9,49] (3)

10 Write about folding method used for hashing (3)

PART B

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

Module 1

11 a) Describe the different notations used to describe the asymptotic running time of an algorithm (7)

b) Explain System life Cycle in detail. (7)

12 a) What is the purpose of calculating the frequency count? Compute the frequency count of the statement x=x+1in the following code fragment (5)

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

b) Explain the importance of time complexity in data structure. Derive the Big O notation for the function $f(n)=4n^3+5n^2+7n+3$ (9)

Module 2

13 a) Write an algorithm to perform Binary Search on a given set of 'n' numbers Perform binary search for an element 56 in the set [13,24,35,465,56,67,78,89] (8)

b) Write an algorithm to add two polynomials (single variable polynomials) represented using array. (6)

14 a) What are the disadvantages of representing a linear queue using array? How can we overcome from it? (4)

b) Write algorithms to insert and delete elements from a double ended queue. Use suitable examples to show the different insertion and deletion operations for a set of elements. (10)

Module 3

15 a) Write algorithms to perform the following operations on double linked list (8)

i. Insert a node with data P after a specified node with data Q

ii. Delete a node with data R from the last position

iii. Insert a data with data S into the first position

b) Consider six memory partitions of size 200 KB, 400 KB, 600 KB, 500 KB, 300 KB and 250 KB. These partitions need to be allocated to four processes of sizes 357 KB, 210 KB, 468 KB and 491 KB in that order. (6)

Perform the allocation of processes using-

i. First Fit Algorithm

ii. Best Fit Algorithm

iii. Worst Fit Algorithm

16 a) Assume a Queue is implemented using linked list. Write algorithms for the following operations (8)

i. Insert

ii. Delete

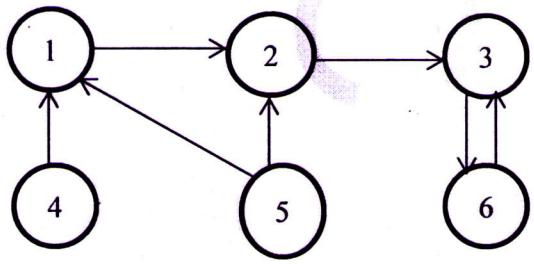
b) Give an algorithm to perform the following operations in a single linked list (6)

i. Count the number of nodes in a single linked list.

ii. Find the number of times a data item called ITEM occurs in the list.

Module 4

17 a) How a graph is represented using adjacency matrix? Give example. Explain BFS with the help of an algorithm/pseudo code. Perform BFS on the given graph, starting from node 5. (8)



b) Write non recursive algorithm for the inorder and preorder traversal of a binary tree (6)

18 a) Write an algorithm for DFS traversal on a graph. Explain it with an example. (8)

b) Write an algorithm to insert an element in a binary search tree. Create a binary search tree using the value 59.13.8.68,85,9,56,64,25,52,32,18,95,7 (6)

Module 5

19 a) Write about primary and secondary clustering. (4)

b) What is MAX HEAP? Write an algorithm to perform Heap sort for a set of values 16,14,10,8,7,9,3,2,4,1 (10)

20 a) Write an algorithm for quicksort. Show the working of algorithm for the following input [56,35,81,11,46,75,26,69] (8)

b) Demonstrate the insertion of keys 15,11,25,16,9,8,12 into a hash table of size 10 with collision resolved by Linear Probing. Let the table having 10 slots starting with index 1. Let the hash function be H(K)=K MOD 7+1 (6)

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