



SESSION: 2023-2024 (ODD SEMESTER)

FIRST ASSIGNMENT

Degree : B.E
 Branch : CSE
 Course Title : Data Structures and Applications
 Date : 14/12/2023

Semester : III A&B
 Course Code : BCS304
 Max Marks : 25
 Submission Date : 22/12/2023

| Q No. | Questions | Marks | K-Level | CO mapping |
|-------|---|-------|-------------|------------|
| 1 | <p>a) Define Data structures. Give its classification and explain in brief. What are the basic operations that can be performed on Data structure?</p> <p>b) Explain the dynamic memory allocation functions in detail with example. Differentiate between malloc() and calloc() functions.</p> <p>c) Define linear array? Develop a C program for the following array operations</p> <ul style="list-style-type: none"> i) Inserting an element at the given valid position ii) Deleting an element at a given valid position iii) Display of array elements iv) Exit <p>Support the program with functions for each of the above operations.</p> <p>d) Define pointers? How to declare and initialize pointer? Justify how pointers can be dangerous.</p> | 5 | Applying K3 | CO1 |
| 2 | <p>a) Develop the algorithm of first Pattern matching Algorithm and Knuth Morris Pratt Pattern Matching Algorithm and Apply both on the following data T=abcaabaaabcaaabbc P1=aaabb and P2=aaa</p> <p>b) Define Stack. Discuss how to represent stack using dynamic arrays. Develop a c program to demonstrate various stack operations, including cases for overflow and underflow of STACK.</p> <p>c) Develop an algorithm for Evaluation of Postfix expression and evaluate the following expressions</p> <ul style="list-style-type: none"> i) $23^5 22^{*+} 126/-$ ii) $12+3-21+3^+$ | 5 | Applying K3 | CO1 |

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|---|--|---|--------------------|
| | <p>d) Develop an algorithm to convert from Infix to Postfix expression. Apply the same for the following expressions</p> <p>i) $A+(B*C-(D/E^F)*G)*H$ ii) $a/b-c+d*e+a*c$</p> | | |
| 3 | <p>a) Define two ways to represent polynomial in C and show the structural representation for the given 2 polynomials, $A(x)=4x^{15}+3x^4+5$ and $B(x)=2x^{1000}+10$. Develop a C function to add 2 polynomials.</p> <p>b) Explain ADT of the polynomial.</p> <p>c) Explain ADT of sparse matrix.</p> <p>d) Develop a C function for Fast transpose of Sparse Matrix. Identify the triplet form of Sparse matrix and find the transpose of the given Matrix</p> <p>a) $\begin{pmatrix} 10 & 0 & 0 & 25 & 0 \\ 0 & 23 & 0 & 0 & 45 \\ 0 & 0 & 0 & 0 & 32 \\ 42 & 0 & 0 & 31 & 0 \\ 0 & 0 & 32 & 0 & 0 \end{pmatrix}$</p> <p>b) $\begin{pmatrix} 0 & 10 & 0 & 20 & 0 \\ 30 & 0 & 0 & 0 & 40 \\ 0 & 50 & 0 & 0 & 0 \\ 0 & 0 & 60 & 0 & 0 \end{pmatrix}$</p> | 5 | Applying K3 CO1 |
| 4 | <p>a) Define queue. Explain the operations performed on queue. Discuss dequeue.</p> <p>b) Discuss the disadvantage of the ordinary queue and how it is solved using a circular queue? Develop insertion and deletion functions for circular queue.</p> | 5 | Applying K3 CO2 |
| 5 | <p>a) Define priority queue. Explain in detail One-Way list representation of a Priority Queue with an example.</p> <p>b) Explain with a suitable example of how you would implement a circular queue using a dynamically allocated array.</p> | 5 | Applying K3 CO2 |

Kaushik
Course In charge

K. S. Rao
HOD



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|-------|--|-------|----------------|------------|
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| 2 | <p>a) Define pointers? How to declare and initialize pointer? Justify how pointers can be dangerous.</p> <p>b) Develop the algorithm of first Pattern matching Algorithm and Knuth Morris Pratt Pattern Matching Algorithm and Apply both on the following data a) T=abcaabaaabcaabbc P1=aaabb and P2=aaa</p> <p>c) Develop an algorithm for Evaluation of Postfix expression and evaluate the following expressions i) $23^5 22^{*+126/-}$ ii) $12+3-21+3^+$</p> <p>d) Develop an algorithm to convert from Infix to Postfix expression. Apply the same for the following expressions i) $A+(B*C-(D/E^F)*G)*H$ ii) $a/b-c+d*e+a*c$</p> | 5 | Applying K3 | CO1 |
| 3 | <p>1) a) Define the 2 ways to represent polynomial in C and show the structural representation for the given 2 polynomials, $A(x)=4x^{15}+3x^4+5$ and $B(x)=2x^{1000}+10$. Develop a C function to add 2 polynomials.</p> | 5 | Applying K3 | CO1 |



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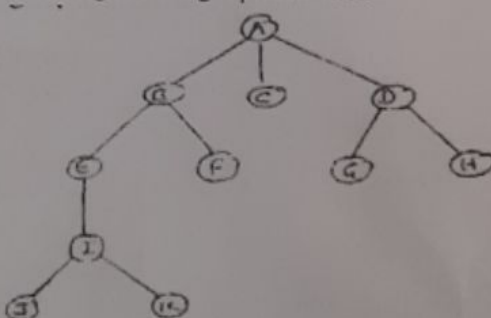
SECOND ASSIGNMENT

Degree : B.E
Branch : CSE
Course Title : Data Structures and Applications
Date : 22/01/2024

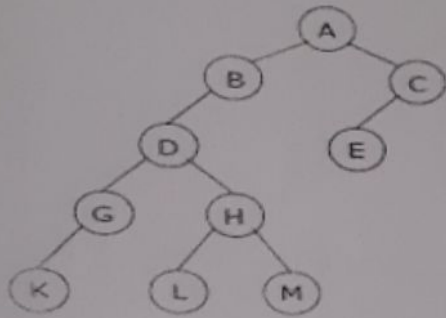
Semester : III A&B
Course Code : BCS304
Max Marks : 25
Last Date : 27/01/2024

for submission

| Q No. | Questions | Marks | K-Level | CO mapping |
|-------|---|-------|----------------|------------|
| 1 | <p>a) Define Recursion Evaluate $A(1,3)$ using Ackerman's function. Develop a C function for Tower of Hanoi.</p> <p>b) Define linked list. Illustrate the representation of linked lists in memory.</p> <p>c) Differentiate between array and Linked List.</p> <p>d) Write a note on a header linked list</p> <p>e) Explain linked stack and queue.</p> | 5 | Applying K3 | CO2 |
| 2 | <p>a) Construct the node structure to create a linked of integers and write C functions to perform the following:</p> <p>i. Create a three-node list with data 10,20 and 30.</p> <p>ii. Insert a node with data value 15 in between the nodes having data values 10 and 20.</p> <p>iii. Delete the node which is followed by a node whose data value is 20.</p> <p>iv. Display the resulting singly linked list.</p> <p>b) Develop a function for addition of two polynomials using linked List and Consider the given 2 polynomials, $a=3x^2+2x+1$ and $b=5x^2-x+2$. Represent the polynomials using Linked list.</p> <p>c) Define a linked list? Explain the different types of linked lists with a diagram.</p> <p>d) Develop C program to implement the insert and delete operation of stack and queue using a single linked list.</p> | 5 | Applying K3 | CO2 |

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|---|---|---|----------------|-----|
| 3 | <p>a) Develop the following functions for singly linked list(chains):</p> <ol style="list-style-type: none"> Reverse/Invert the list Concatenate two lists. Search an element in the list <p>b) Explain the advantage of Doubly linked list over Singly Linked list. Develop a C function for the following operations on DLL</p> <ol style="list-style-type: none"> Insert at front Insert at last, Delete at front Delete at end Display and count number of nodes <p>c) Develop a C function for the following operations on circular linked list</p> <ol style="list-style-type: none"> Insert at front Insert at rear Finding the length of a circular list <p>d) Describe Doubly linked list with advantages and disadvantages. Develop a C function to delete a node from a Circular Doubly linked list with the header node.</p> | 5 | Applying K3 | CO3 |
| 4 | <p>a) Explain the concept of sparse matrix using Linked list. Write a node structure for linked representation and apply it for the following matrix</p> $A = \begin{bmatrix} 0 & 0 & 3 & 0 & 4 \\ 0 & 0 & 5 & 7 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 2 & 6 & 0 & 0 \end{bmatrix}$ <p>b) Define the following and illustrate with suitable examples i) Binary tree ii) Full binary tree iii) Almost complete binary tree iv) Strict binary tree v) Skewed binary tree</p> <p>c) Define Tree. Represent the below given tree using</p> <ol style="list-style-type: none"> Linked list representation with parenthetical notation Left-child right-sibling representation  | 5 | Applying K3 | CO3 |
| 5 | <p>a) Describe the Array and Linked representation of binary tree with suitable examples.</p> <p>b) Define Binary tree with an example. Develop a C recursive routine to</p> | 5 | Applying K3 | CO3 |

traverse the given tree using in-order, pre-order, post-order and level order



c) **Explain** Threaded binary tree and their representation with neat diagram and also **develop** a C function to do the inorder traversal of a threaded binary tree.

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