

- b. Develop C functions to implement the following in a doubly linked list:
 i) Insert a node at the front
 ii) Delete a node from the end.
- c. Develop C functions to implement the various operations of queues using linked list.

(08 Marks)

(08 Marks)

Module-4

- 7 a. With suitable examples, define the following:
 i) Degree of a node
 ii) Level of a binary tree
 iii) Complete binary tree
 iv) Full binary tree.
- b. Construct binary search tree for the given set of values 14, 15, 4, 9, 7, 18, 3, 5, 16, 20. Also, perform inorder, preorder and postorder traversals of the obtained tree.
- c. Explain threaded binary trees and their representation with a neat diagram. Also, develop a C function to do the inorder traversal of a threaded binary tree.

(06 Marks)

(06 Marks)

(08 Marks)

OR

- 8 a. Explain the array and linked representation of binary trees with suitable examples.
- b. A binary tree has 9 nodes. The inorder and preorder traversals yield the following sequences of nodes:
 Inorder: E A C K F H D B G
 Preorder: F A E K C D H G B
 Draw the binary tree. Also, perform the post order traversal of the obtained tree.
- c. Develop C functions to implement the following:
 i) Search a key value in a binary search tree
 ii) Copying a binary tree.

(06 Marks)

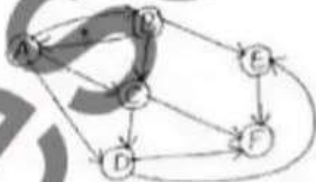
(08 Marks)

Module-5

- 9 a. Define a graph. For the graph shown in Fig.Q.9(a), show the adjacency matrix and adjacency list representations.

(06 Marks)

Fig.Q.9(a)



- b. Suppose an array contains 8 elements as follows: 77, 33, 44, 11, 88, 22, 66, 55. Sort the array using insertion sort algorithm.
- c. What is hashing? Explain the following hash functions with proper examples:
 i) Division ii) Mid-square iii) Folding.

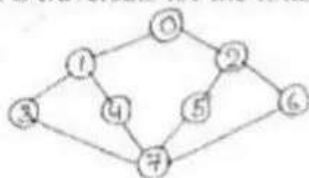
(06 Marks)

(08 Marks)

OR

- 10 a. Briefly explain Breadth-First Search (BFS) and Depth-First Search (DFS) traversal of a graph. Also, show the BFS and DFS traversals for the following graph in Fig.Q.10(a).

Fig.Q.10(a)



(06 Marks)

- b. Suppose 9 cards are punched as follows: 348, 143, 361, 423, 538, 128, 321, 543, 366. Apply radix sort to sort them in 3 phases.
- c. What is Collision? Explain the collision resolution techniques with proper examples.

(06 Marks)

(08 Marks)

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Third Semester B.E. Degree Examination, July/August 2022

Data Structures and Applications

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define data structures. Explain the classification of data structures with examples. (06 Marks)
 b. Explain the dynamic memory allocation functions supported by 'C' with syntax and examples. (06 Marks)
 c. Consider the pattern P = ababab. Construct the table and the corresponding labeled directed graph used in the fast or second pattern matching algorithm. Trace it for the input text T = abaabababba. (08 Marks)

OR

- 2 a. Differentiate between structures and unions. Show examples for both. (06 Marks)
 b. Explain any four string handling functions supported by 'C' with syntax and examples. (06 Marks)
 c. Explain the representation of linear arrays in memory. Also, consider the linear arrays AAA (5:50) and BBB(-5:10).
 i) Find the number of elements in each array.
 ii) Suppose Base (AAA) = 300, Base (BBB) = 500 and 4 words per memory cell for AAA, 2 words per memory cell for BBB, find the address of AAA[15], AAA[55], BBB[8] and BBB[0]. (08 Marks)

Module-2

- 3 a. Define a stack. Explain the different operations that can be performed on stacks with suitable 'C' functions and examples. (07 Marks)
 b. Convert the following infix expression into postfix expression using stack.
 $A + (B * C - (D / E ^ F) * G) * H.$ (05 Marks)
 c. Develop a C recursive program for tower of Hanoi problem. Trace it for 3 disks with schematic call tree diagram. (08 Marks)

OR

- 4 a. Develop C functions to implement insertion, deletion and display operations of a circular queue. (07 Marks)
 b. Write an algorithm to evaluate a postfix expression. Trace the algorithm for the following expression showing the stack contents $6\ 5\ 1 - 4 * 23 ^ / +$. (06 Marks)
 c. Define Ackermann function recursively and evaluate A(3, 0). Also, develop C code for the same. (07 Marks)

Module-3

- 5 a. Write the differences between arrays and linked lists. (04 Marks)
 b. Develop C functions to implement the following in a singly linked list:
 i) Delete a node from the front ii) Concatenate two linked lists. (08 Marks)
 c. Develop a C function to add two polynomials using singly linked list. (08 Marks)

OR

- 6 a. Show the diagrammatic linked representation for the following sparse matrix:

$$\begin{bmatrix} 0 & 1 & 2 \\ 3 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

(04 Marks)

OR

- 6 a. Write a node structure for linked representation of a polynomial. Explain the algorithm to add two polynomials represented using linked list. (08 Marks)
- b. Write C functions insert_front() and delete_front() using doubly linked list. (08 Marks)
- c. For the given Sparse matrix, give the linked list representation. (04 Marks)

$$A = \begin{bmatrix} 0 & 0 & 4 & 0 & 0 \\ 6 & 5 & 0 & 0 & 0 \\ 0 & 3 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 2 \end{bmatrix}$$

Module-4

- 7 a. What is a tree? With suitable example, define (i) Binary tree (ii) Complete binary tree (iii) Strictly Binary tree (iv) Skewed binary tree. (10 Marks)
- b. Consider the following tree T in Fig.Q7(b). Write the preorder, inorder and postorder traversals for the tree T along with C functions. Also find the depth of tree T.

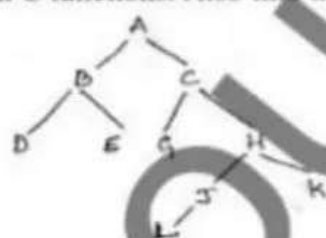


Fig.Q7(b)

(10 Marks)

OR

- 8 a. Write the recursive search and iterative search algorithm for a binary search tree. (08 Marks)
- b. For the given data, draw a binary search tree and show the array and linked representation of the same. (06 Marks)
- 100, 85, 45, 55, 110, 20, 70, 65
- c. What is the advantage of threaded binary tree over binary tree? Construct the threaded binary tree for 10, 20, 30, 40, 50. (06 Marks)

Module-5

- 9 a. What is a graph? Give the difference between graph and tree. For the given graph [Fig.Q9(a)], show the adjacency matrix and adjacency list representation of the graph.

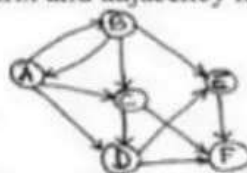


Fig.Q9(a)

(08 Marks)

- b. Write an algorithm for Breadth first search and depth first search. (08 Marks)
- c. Define the following terms with examples: (04 Marks)
- i) Multigraph ii) Complete graph.

OR

- 10 a. What is hashing? Explain any 3 popular Hash functions. (08 Marks)
- b. Write an algorithm for Radix sort. (06 Marks)
- c. Summarize any 3 widely used file organization techniques. (06 Marks)

CBCS SCHEME

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Third Semester B.E. Degree Examination, Jan./Feb. 2023 Data Structures and Applications

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Compare Structures and Unions. (04 Marks)
- b. Define data structures. Give its classifications. What are the basic operations that can be performed on data structures? (08 Marks)
- c. What is a Sparse matrix? Write the ADT of sparse matrix. Give the triplet form of a given matrix and also find its transpose.

$$A = \begin{bmatrix} 7 & 0 & 0 & 0 & 0 \\ 0 & 0 & 9 & 0 & 0 \\ 3 & 0 & 2 & 0 & 0 \\ 0 & 0 & 0 & 0 & 5 \end{bmatrix}$$

Fig.Q1(c)

(08 Marks)

OR

- 2 a. Define polynomial? Explain with example how $A(x) = 3x^{23} + 3x^4 + 4x^2 + 15$ and $B(x) = x^5 + 20x^3 + 2$, are stored in a 1-D array? (06 Marks)
- b. What are the structures used to store strings in memory? Explain with examples. (06 Marks)
- c. Write a C program to demonstrate the basic operations on arrays. (08 Marks)

Module-2

- 3 a. Define Stack. Write C functions for demonstrating various stack operations. (08 Marks)
- b. Write an algorithm to evaluate postfix expression and trace the same on given expressions:
 - i) $1\ 2\ 3\ +\ * \ 3\ 2\ 1\ -\ +\ *$
 - ii) $6\ 2\ 3\ +\ - \ 3\ 8\ 2\ / \ + \ * \ 2\ 5\ 3\ +$
- c. Write the postfix form of the following expression using stack:
 - i) $(a + b) * d + e / (f + a * d) + c$
 - ii) $((a / (b - c + d)) * (e - a) * c)$

(04 Marks)

OR

- 4 a. Define queue. Write QINSERT and QDELETE procedures for queues using arrays. (10 Marks)
- b. What is Recursion? Write recursion procedure for (i) Finding GCD of two numbers. (10 Marks)
- (ii) To find n Fibonacci numbers.

Module-3

- 5 a. What is a linked list? List and explain the different types of linked list with examples. (08 Marks)
- b. Write the following algorithms for singly linked list:
 - (i) Inserting ITEM as the first node in the list.
 - (ii) Deleting the last node in the list.
- c. What is the advantage of doubly linked list over singly linked list? Illustrate with an example. (04 Marks)

Module-3

- 5 a. Write a C function to concatenate two singly linked list. (06 Marks)
 b. Give the structure definition for singly linked list. Write a C function to:
 (i) Insert an element at the end (08 Marks)
 (ii) Delete a node at the beginning (06 Marks)
 c. Discuss how to read a polynomial consisting of 'n' terms implemented using linked list. (06 Marks)

OR

- 6 a. Write a function to delete a node whose information field is specified in singly linked list. (06 Marks)
 b. What is circular doubly linked list? Write a C function to perform the following operations on circular doubly linked list:
 (i) Insert a node at the beginning (08 Marks)
 (ii) Delete a node from the list (06 Marks)
 c. Discuss how to implement stacks and queues using linked list. (06 Marks)

Module-4

- 7 a. Define binary tree. List and discuss any two properties of binary tree. (06 Marks)
 b. Write a function to perform the following operations on Binary Search Tree (BST):
 (i) Deletion from a BST (08 Marks)
 (ii) Inserting an element into a BST (06 Marks)
 c. Define Threaded Binary Tree. Discuss In-threaded binary tree. (06 Marks)

OR

- 8 a. Discuss how binary tree are represented using (i) Array (ii) Linked list (06 Marks)
 b. Discuss inorder, preorder, postorder and level order traversal with suitable recursive function for each. (08 Marks)
 c. Write a C function to evaluate an expression using expression tree. (06 Marks)

Module-5

- 9 a. Design a C program for the following operation on Graph (G) of cities:
 (i) Create a graph of N cities using adjacency matrix (10 Marks)
 (ii) Print all the nodes reachable from a given starting node in a digraph using BFS/DFS method (10 Marks)
 b. Discuss AVL tree with an example. Write a function for insertion into an AVL tree. (10 Marks)

OR

- 10 a. Define hashing. What are the two criteria, a good hash function should satisfy? Discuss open addressing and chaining method with an example. (10 Marks)
 b. Define Red-Black tree, Splay tree and B tree. Discuss the method to insert an element into Red-Black tree. (10 Marks)

Third Semester B.E. Degree Examination, Jan./Feb. 2023

Data Structures and Applications

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.***Module-1**

- 1 a. What is linear array? Discuss the representation of linear array in memory. (06 Marks)
b. Differentiate between static and dynamic memory allocations. Discuss four dynamic memory allocation functions. (06 Marks)
c. Write a menu driven program in C for the following array operations:
(i) Inserting an element (ELEM) at a given valid position.
(ii) Deleting an element at a given valid position.
(iii) Display of array elements.
(iv) Exit
Support the program with functions for each of the above operations. (08 Marks)

OR

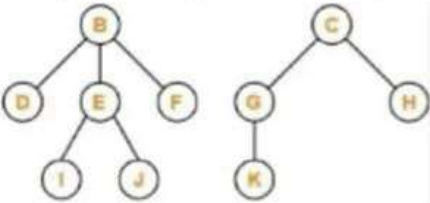
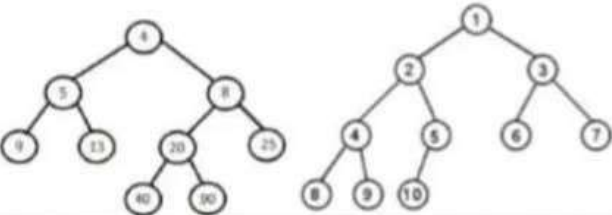
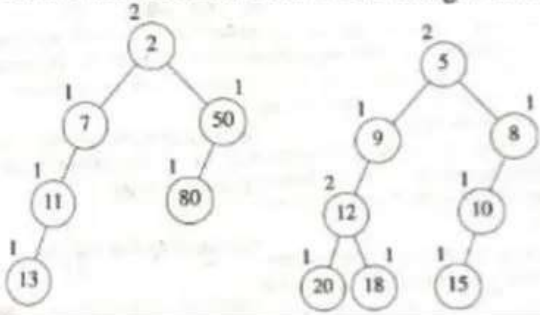
- 2 a. Give Abstract Data Type (ADT) for arrays. How array can be declared and initialized? (06 Marks)
b. With suitable example, discuss self-referential structures. (06 Marks)
c. Define Sparse matrix. How to represent a Sparse matrix? Write an algorithm/function to transpose a given Sparse matrix. (08 Marks)

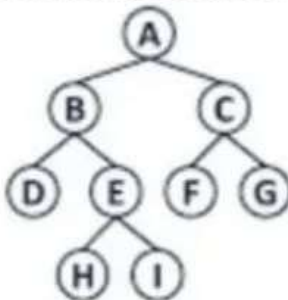
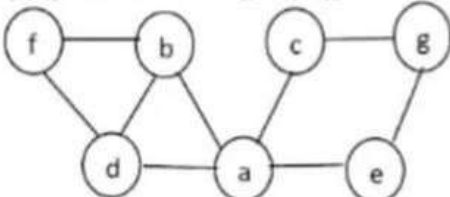
Module-2

- 3 a. Define Stack. Discuss how to represent stack using dynamic arrays. (06 Marks)
b. Write a menu driven C program for the following operations on STACK of integers:
(i) Push an element on to stack
(ii) Pop an element from the stack
(iii) Display the content of stack
(iv) Exit
Show the overflow and underflow conditions. (06 Marks)
c. What are the disadvantages of ordinary queue? Discuss the implementation of circular queue using arrays. (08 Marks)

OR

- 4 a. What is Recursion? Write recursive function to solve Towers of Hanoi problem. (06 Marks)
b. Discuss the following:
(i) Double Ended Queue
(ii) Priority Queue (06 Marks)
c. Write an algorithm to convert infix expression to postfix expression. Show the content of stack to convert the following infix expression:
 $A * (B + D) / E - F * (G + H / K)$ (08 Marks)

OR				
Q. 08	a	Define Binary Search tree. Construct a binary search tree (BST) for the following elements: 100, 85, 45, 55, 120, 20, 70, 90, 115, 65, 130, 145. Traverse using in-order, pre-order, and post-order traversal techniques. Write recursive C functions for the same.	L3	8
	b	Define Forest. Transform the given forest into a Binary tree and traverse using inorder, preorder and postorder traversal. 	L2	6
	c	Define the Disjoint set. Consider the tree created by the weighted union function on the sequence of unions: union(0,1), union(2,3), union(4,5), union(6,7), union(0,2), union(4,6), and union(0,4). Process the simple find and collapsing find on eight finds and compare which find is efficient.	L2	6
Module-5				
Q. 09	a	What is chained hashing? Discuss its pros and cons. Construct the hash table to insert the keys: 7, 24, 18, 52, 36, 54, 11, 23 in a chained hash table of 9 memory locations. Use $h(k) = k \bmod m$.	L3	10
	b	Define the leftist tree. Give its declaration in C. Check whether the given binary tree is a leftist tree or not. Explain your answer. 	L2	5
	c	What is dynamic hashing? Explain the following techniques with examples: i) Dynamic hashing using directories ii) Directory less dynamic hashing	L2	5
OR				
Q. 10	a	What is a Priority queue? Demonstrate functions in C to implement the Max Priority queue with an example. i) Insert into the Max priority queue ii) Delete into the Max priority queue iii) Display Max priority queue	L3	10
	b	Define min Leftist tree. Meld the given min leftist trees. 	L2	5
	c	Define hashing. Explain different hashing functions with examples. Discuss the properties of a good hash function.	L2	5

Module-3																																				
Q. 05	a	<p>Write recursive C functions for inorder, preorder and postorder traversals of a binary tree. Also, find all the traversals for the given tree.</p> 	L3	8																																
	b	<p>Write C functions for the following</p> <p>i) Search an element in the singly linked list.</p> <p>ii) Concatenation of two singly linked list</p>	L2	6																																
	c	<p>Define Sparse matrix. For the given sparse matrix, give the linked list representation:</p> $A = \begin{bmatrix} 0 & 0 & 3 & 0 & 4 \\ 0 & 0 & 5 & 7 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 2 & 6 & 0 & 0 \end{bmatrix}$	L3	6																																
OR																																				
Q. 06	a	<p>Write C Functions for the following</p> <p>i) Inserting a node at the beginning of a Doubly linked list</p> <p>Deleting a node at the end of the Doubly linked list</p>	L3	8																																
	b	<p>Define Binary tree. Explain the representation of a binary tree with a suitable example.</p>	L2	6																																
	c	<p>Define the Threaded binary tree. Construct Threaded binary for the following elements: A, B, C, D, E, F, G, H, I</p>	L3	6																																
Module-4																																				
Q. 07	a	<p>Design an algorithm to traverse a graph using Depth First Search (DFS). Apply DFS for the graph given below.</p> 	L3	8																																
	b	<p>Construct a binary tree from the Post-order and In-order sequence given below</p> <p>In-order: GDHBAEICF</p> <p>Post-order: GHDBIEFCA</p>	L2	6																																
	c	<p>Define selection tree. Construct min winner tree for the runs of a game given below. Each run consists of values of players. Find the first 5 winners.</p> <table border="1" data-bbox="261 1881 772 2038"> <tr><td>10</td><td>9</td><td>20</td><td>6</td><td>8</td><td>9</td><td>90</td><td>17</td></tr> <tr><td>15</td><td>20</td><td>20</td><td>15</td><td>15</td><td>11</td><td>95</td><td>18</td></tr> <tr><td>16</td><td>38</td><td>30</td><td>25</td><td>50</td><td>16</td><td>99</td><td>20</td></tr> <tr><td></td><td></td><td></td><td>28</td><td></td><td></td><td></td><td></td></tr> </table>	10	9	20	6	8	9	90	17	15	20	20	15	15	11	95	18	16	38	30	25	50	16	99	20				28					L2	6
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Model Question Paper-I with effect from 2023-24 (CBCS Scheme)

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Third Semester B.E. Degree Examination Data Structures and Applications

TIME: 03 Hours

Max. Marks: 100

Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.

Module -1			*Bloom's Taxonomy Level	Marks
Q.01	a	Define data structures. With a neat diagram, explain the classification of data structures with examples.	L2	5
	b	What do you mean by pattern matching? Outline the Knuth Morris Pratt (KMP) algorithm and illustrate it to find the occurrences of the following pattern. P: ABCDABD S: ABC ABCDAB ABCDABCDABDE	L3	8
	c	Write a program in C to implement push, pop and display operations for stacks using arrays.	L3	7
OR				
Q.02	a	Explain in brief the different functions of dynamic memory allocation.	L2	5
	b	Write functions in C for the following operations without using built-in functions i) Compare two strings. ii) Concatenate two strings. iii) Reverse a string	L3	8
	c	Write a function to evaluate the postfix expression. Illustrate the same for the given postfix expression: ABC-D*+E\$F+ and assume A=6, B=3, C=2, D=5, E=1 and F=7.	L3	7
Module-2				
Q. 03	a	Develop a C program to implement insertion, deletion and display operations on Linear queue.	L3	10
	b	Write a program in C to implement a stack of integers using a singly linked list.	L3	10
OR				
Q.04	a	Write a C program to implement insertion, deletion and display operations on a circular queue.	L3	10
	b	Write the C function to add two polynomials. Show the linked representation of the below two polynomials and their addition using a circular singly linked list P1: $5x^3 + 4x^2 + 7x + 3$ P2: $6x^2 + 5$ Output: add the above two polynomials and represent them using the linked list.	L3	10

Module-4

- 7 a. Define a binary tree. Explain how do you construct and add a NODE to binary tree using C-statements. Also explain how do you represent a binary tree using arrays. (09 Marks)
- b. Define binary tree traversal method. List and explain the different binary tree traversal methods along with C-functions. (08 Marks)
- c. Find the INORDER, PREORDER and POSTORDER for the following:

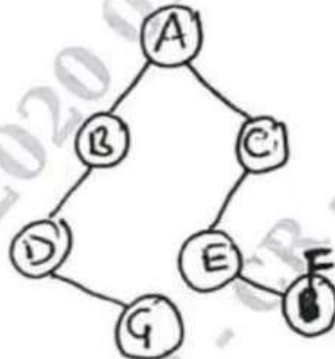


Fig.Q7(c)

(03 Marks)

OR

- 8 a. Define expression tree. Using a C-function, explain how do you construct a expression tree. Construct an expression tree for : $a + b * c / f^g - h$. (10 Marks)
- b. With diagrammatic explanation, explain how do you create and construct a BST. Also write C-functions for the same. (10 Marks)

Module-5

- 9 a. Define a graph and its traversal methods. List and explain the different graph traversal methods. Find the resultants of the types of graph traversal methods on the following graph : (consider 'a' as starting vertex).

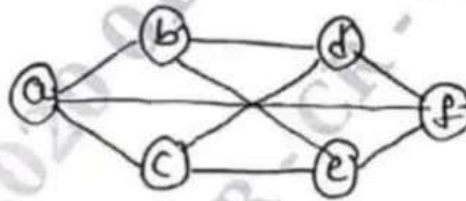


Fig.Q9(a)

(12 Marks)

- b. Write address calculation sort algorithm. Sort Z, A, P, B, Q, I, J, K using the address calculation sort algorithm. (08 Marks)

OR

- 10 a. Define file. List basic file operations. Explain any four operations with syntax and example. (10 Marks)
- b. Define Hashing. Explain the method of sorting data using a Hash function in a Hash table. Identify the problem that occurs during the value storage. Explain how do you resolve the problem using Hashing technique. (10 Marks)



Third Semester B.E. Degree Examination, Aug./Sept.2020
Data Structures and Applications

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define data structures. List and explain the different operations that can be carried on arrays. (10 Marks)
- b. Define pointers. List the advantages of pointers over arrays. (04 Marks)
- c. Define dynamic memory allocation. List and write with explanation the syntax of dynamic memory allocating functions. (06 Marks)

OR

- 2 a. Define strings. List and explain any 5 operations with example. (12 Marks)
- b. Is it possible to store the contents of an array into a pointer? Justify your opinion and with suitable C-statements. (08 Marks)

Module-2

- 3 a. Define a stack. Explain the different operation that can be performed on stack using C-functions and show them using diagrammatic representations. (10 Marks)
- b. Write an algorithm to convert a parenthesized infix expression to postfix. Apply the algorithm and show the contents of stack during conversion for the expression : $(A + B * C) * ((D + E - F) / J)$. (07 Marks)
- c. Differentiate recursion and iteration process. (03 Marks)

OR

- 4 a. Write a C-recursive function for
i) Adding n-odd natural numbers
ii) Adding n-even natural numbers. (08 Marks)
- b. Define a queue. List the different types of queues. State the limitation of ordinary queue. Explain how do you overcome the limitation by specifying the required C-statements and diagrammatic representation using an example. (12 Marks)


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Module-3

- 5 a. With the C-statements, explain how do you create a node, add and delete on Singly Linked List (SLL) with proper message where each node is containing the details of employee in the form of EmpId, EmpName, Empaddr and Empsalary as data fields. (10 Marks)
- b. Write and explain how do you implement the operations of stack using Singly Linked List (SLL) with the help of C-statements. (10 Marks)

OR

- 6 a. Differentiate Single (SLL) and Doubly (DLL) linked lists. (04 Marks)
- b. State the advantage of Doubly Linked List over Singly Linked List. (02 Marks)
- c. Implement addition and deletion of a NODE on a Doubly Linked List (DLL) with required C-statements. (14 Marks)

c.	For the given sparse matrix, give the diagrammatic linked representation.	4	L3	CO3
$A = \begin{bmatrix} 2 & 0 & 0 & 0 \\ 4 & 0 & 0 & 3 \\ 0 & 0 & 0 & 0 \\ 8 & 0 & 0 & 1 \\ 0 & 0 & 6 & 0 \end{bmatrix}$				
OR				
Q.6	a. Discuss how binary tree are represented using, (i) Array (ii) Linked list	6	L2	CO3
	b. Discuss inorder, preorder, postorder and level order traversal with suitable recursive function for each.	8	L2	CO3
	c. Define Threaded Binary Tree. Discuss In-Threaded binary Tree.	6	L2	CO3
Module – 4				
Q.7	a. Write a function to perform the following operations on Binary Search Tree (BST) : (i) Inserting an element into BST. (ii) Recursive search of a BST.	8	L3	CO4
	b. Discuss selection Trees with an example.	8	L2	CO4
	c. Explain Transforming a first into a binary tree with an example.	4	L2	CO4
OR				
Q.8	a. Define graph. Show the adjacency matrix and adjacency list representation of the graph given below (Refer Fig. Q8 (a))	6	L3	CO4
	 <p style="text-align: center;">Fig. Q8 (a)</p>			
	b. Define the following Terminologies with examples, (i) Digraph (ii) Weighted graph (iii) Self loop (iv) Parallel edges	8	L1	CO4
	c. Explain in detail elementary graph operations.	6	L2	CO4
Module – 5				
Q.9	a. What is collision? What are the methods to resolve collision? Explain linear probing with an example.	7	L2	CO5
	b. Explain in detail, about static and dynamic hashing.	6	L2	CO5
	c. Discuss B+ Trees with an example.	7	L2	CO5
OR				
Q.10	a. Explain different types of HASH function with example.	6	L2	CO5
	b. Discuss AVL tree with an example. Write a function for insertion into an AVL Tree.	6	L3	CO5
	c. Define Red-black Tree, Splay tree. Discuss the method to insert an element into Red-Black tree.	8	L2	CO5

Third Semester B.E./B.Tech. Degree Examination, Dec.2023/Jan.2024
Data Structures and Applications

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
 2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1				M	L	C
Q.1	a.	Define Data Structures. Explain with neat block schematic different type of data structures with examples. What are the primitive operations that can be performed?	10	L2	CO1	
	b.	Differentiate between structures and unions shown examples for both.	5	L1	CO1	
	c.	What do you mean by pattern matching? Outline knuth, Morris, Pratt pattern matching algorithm.	5	L2	CO1	
OR						
Q.2	a.	Define stack. Give the implementation of Push (), POP () and display () functions by considering its empty and full conditions.	7	L2	CO1	
	b.	Write an algorithm to evaluate a postfix expression and apply the same for the given postfix expression 6, 2, /, 3, -, 4, 2, *, +	7	L3	CO1	
	c.	Write the Postfix form of the following using stack (i) $A*(B*C+D*E)+F$ (ii) $(a+(b*c)/(d-e))$	6	L3	CO1	
Module – 2						
Q.3	a.	What are the disadvantages of ordinary queue? Discuss the implementation of circular queue.	8	L2	CO2	
	b.	Write a note on multiple stacks and priority queue.	6	L2	CO2	
	c.	Define Queue. Discuss how to represent queue using dynamic arrays.	6	L2	CO2	
OR						
Q.4	a.	What is a linked list? Explain the different types of linked lists with neat diagram.	4	L2	CO2	
	b.	Give the structure definition for singly linked list (SLL). Write a C function to, (i) Insert an element at the end of SLL. (ii) Delete a node at the beginning of SLL.	8	L3	CO2	
	c.	Write a C-function to add two polynomials show the linked list representation of below two polynomials $p(x) = 3x^{12} + 2x^8 + 1$ $q(x) = 8x^{14} - 3x^{10} + 10x^6$	8	L3	CO2	
Module – 3						
Q.5	a.	Write a C-function for the following operations on Doubly Linked List (DLL): (i) addition of a node. (ii) concatenation of two DLL.	8	L3	CO3	
	b.	Write C functions for the following operations on circular linked list : (i) Inserting at the front of a list. (ii) Finding the length of a circular list.	8	L3	CO3	

c.

Priority queues

07

L2

CO2

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Module - 4

Q.7	a.	For the given data, draw a binary search tree. 100, 85, 45, 55, 110, 20, 70, 65	07	L3	CO4
	b.	List and explain the common operations of binary search tree.	07	L2	CO4
	c.	Explain about forests.	06	L2	CO2
OR					
Q.8	a.	Define graph. Explain graph abstract data types.	10	L2	CO4
	b.	Explain the elementary graph operations.	10	L2	CO4
Module - 5					
Q.9	a.	Define hashing. Explain types of hashing functions in detail.	10	L2	CO5
	b.	Explain static hashing and dynamic hashing in detail.	10	L2	CO5
OR					
Q.10		Write a short note on :			
	a.	Leftist trees	06	L2	CO4
	b.	Optimal binary search tree	07	L2	CO5
	c.	Priority queues	07	L2	CO2

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Third Semester B.E./B.Tech. Degree Examination, June/July 2024

Data Structures and Applications

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks, L: Bloom's level, C: Course outcomes.*

Module – 1				M	L	C																														
Q.1	a.	What is data structure? List and explain data structure operations.		08	L2	CO1																														
	b.	Discuss four dynamic memory allocation functions.		08	L2	CO1																														
	c.	With suitable example, discuss self-referential structures.		04	L2	CO1																														
OR																																				
Q.2	a.	What is sparse matrix? Give the triplet form for given matrix and also find its transpose. <div style="margin-left: 40px;"><table><tr><td></td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td>0</td><td>10</td><td>0</td><td>0</td><td>40</td></tr><tr><td>1</td><td>11</td><td>0</td><td>22</td><td>0</td></tr><tr><td>2</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>3</td><td>20</td><td>0</td><td>0</td><td>50</td></tr><tr><td>4</td><td>0</td><td>15</td><td>0</td><td>25</td></tr></table></div>		0	1	2	3	0	10	0	0	40	1	11	0	22	0	2	0	0	0	0	3	20	0	0	50	4	0	15	0	25		06	L3	CO2
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1	11	0	22	0																																
2	0	0	0	0																																
3	20	0	0	50																																
4	0	15	0	25																																
	b.	Explain ADT stack.		07	L2	CO2																														
	c.	Define Stack. Implement the operations of stack using arrays.		07	L1	CO2																														
Module – 2																																				
Q.3	a.	What is the advantage of circular queue over ordinary queue? Discuss the implementation of circular queue operations.		08	L2	CO2																														
	b.	Demonstrate multiple stacks and queues with suitable examples.		12	L2	CO2																														
OR																																				
Q.4	a.	Explain Linked Stacks and Queues operations.		10	L2	CO2																														
	b.	Give the C functions for the following on singly linked list with example: i) Insert a node at the beginning ii) Delete a node at the front iii) Display		10	L3	CO3																														
Module – 3																																				
Q.5	a.	Define linked list? Implement C function for the following circular Doubly linked list: i) Insert a node at the beginning ii) Delete a node at the end iii) Display		10	L3	CO3																														
	b.	Develop a function to delete a node whose information field is specified in singly linked list.		10	L3	CO3																														
OR																																				
Q.6	a.	What is a tree? With suitable example, define i) Complete binary tree ii) Degree of the tree iii) Level of a node		07	L2	CO4																														
	b.	List and explain representation of a binary tree?		07	L2	CO4																														
	c.	Explain In-threaded binary tree.		06	L2	CO4																														

Module – 3					
Q.5	a.	Discuss how binary trees are represented using : i) Assay ii) Linked list.	6	L2	CO4
	b.	Define Threaded binary tree. Discuss In – threaded binary tree.	6	L2	CO4
	c.	Write the C function for the following additional list operation : i) Inverting Singly linked list ii) Concatenating Singly linked list.	8	L3	CO3
OR					
Q.6	a.	Discuss Inorder , Preorder , Postorder and Level order traversal with suitable function for each.	8	L3	CO4
	b.	Define the threaded binary tree. Construct threaded binary tree for the following element : A, B, C, D, E, F, G, H, I.	6	L2	CO4
	c.	Write a C function for the following : i) Insert a node at the beginning of doubly linked list. ii) Deleting a node at the end of the doubly linked list.	6	L3	CO3
Module – 4					
Q.7	a.	Define Forest , Transform the forest into a binary tree and traverse using inorder , preorder and postorder traversal with an example.	8	L1	CO5
	b.	Define Binary search tree. Construct a binary search tree for the following elements : 100 , 85 , 45 , 55 , 120 , 20 , 70 , 90 , 115 , 65 , 130 , 145.	6	L2	CO5
	c.	Discuss Selection tree with an example.	6	L2	CO5
OR					
Q.8	a.	Define Graph. Explain adjacency matrix and adjacency list representation with an example.	8	L2	CO5
	b.	Define the following terminology with example : i) Digraph ii) Weighted graph iii) Self loop iv) Connected graph.	6	L2	CO5
	c.	Briefly explain about Elementary graph operations.	6	L3	CO5
Module – 5					
Q.9	a.	Explain in detail about Static and Dynamic Hashing.	6	L2	CO5
	b.	What is Collision? What are the methods to resolve collision?	7	L2	CO5
	c.	Explain Priority queue with the help of an examples.	7	L2	CO5
OR					
Q.10	a.	Define Hashing. Explain different hashing functions with suitable examples.	12	L2	CO5
	b.	Write short note on : i) Leftist trees ii) Optimal binary search tree.	8	L3	CO5

CBCS SCHEME

BCS304



Third Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025 Data Structures and Applications

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks, L: Bloom's level, C: Course outcomes.*

Module – 1				M	L	C
Q.1	a.	Define Data Structures. Explain the classification of data structures with a neat diagram.		8	L2	CO1
	b.	Write a C Functions to implement pop , push and display operations for stacks using arrays.		7	L2	CO2
	c.	Differentiate structures and unions.		5	L2	CO1
OR						
Q.2	a.	Write an algorithm to evaluate a postfix expression and apply the same for the given postfix expression. 6 2 / 3 - 4 2 * +.		7	L3	CO2
	b.	Explain the dynamic memory allocation function in detail.		8	L2	CO1
	c.	What is Sparse matrix? Give the triplet form of a given matrix and find its transpose $A = \begin{bmatrix} 0 & 0 & 3 & 0 & 4 \\ 0 & 0 & 5 & 7 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 2 & 6 & 0 & 0 \end{bmatrix}$		5	L3	CO1
Module – 2						
Q.3	a.	Define Queue. Discuss how to represent a queue using dynamic arrays.		8	L2	CO2
	b.	Write a C Function to implement insertion () , deletion () and display () operations on circular queue.		6	L3	CO2
	c.	Write a note on Multiple stacks and queues with suitable diagram.		6	L2	CO2
OR						
Q.4	a.	What is a linked list? Explain the different types of linked list with neat diagram.		6	L2	CO3
	b.	Write a C function for the following on singly linked list with example : i) Insert a node at the beginning ii) Delete a node at the front iii) Display.		8	L3	CO3
	c.	Write the C function to add two polynomials.		6	L2	CO3