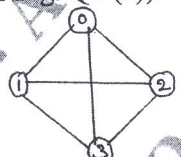USN | | | | | | | | | |

BCS304

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 on 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 $p(x) = 3x^{14} + 2x^8 + 1$ $q(x) = 8x^{14} - 3x^{10} + 10x^6$	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.	For the given sparse matrix, give the diagrammatic linked representation. $$A = \begin{bmatrix} 2 & 0 & 0 & 0 \\ 4 & 0 & 0 & 3 \\ 0 & 0 & 0 & 0 \\ 8 & 0 & 0 & 1 \\ 0 & 0 & 6 & 0 \end{bmatrix}.$$	4	L3	CO3
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)). Fig. Q8 (a)	6	L3	CO4
	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 Leftist 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

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