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CBCS SCHEME

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BCS304

Third Semester B.E./B.Tech. Degree Examination, June / July 2026
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. With a neat diagram explain the classification of data structure with example.	05	L2	CO1
	b.	Write a drawback of static memory allocation. Explain in detail the different functions of dynamic memory allocation.	08	L2	CO1
	c.	Write a program in C to implement push, pop and display operations for stack using array.	07	L3	CO1
		OR			
Q.2	a.	What is sparse matrix? Represent the following sparse matrix in both array and triplet form. Also state any 2 applications of sparse matrix. $A=\begin{bmatrix}10 & 0 & 0 & 25 & 0\\ 0 & 23 & 0 & 0 & 45\\ 0 & 0 & 0 & 0 & 32\\ 42 & 0 & 0 & 31 & 0\\ 0 & 0 & 0 & 0 & 0\\ 0 & 0 & 30 & 0 & 0\end{bmatrix}$	08	L3	CO1
	b.	What is Self – Referential Structure? Bring out the difference between structures and unions.	06	L2	CO1
	c.	i) Write an algorithm to convert infix expression to postfix expression. ii) Convert the following infix expression to post fix expression : ((A + (B – C)* D) E + F	06	L3	CO1
		Module – 2			
Q.3	a.	Give the structure definition for singly linked list. Write a C function to : i) Insert an element at end. ii) Delete a node at the beginning.	08	L3	CO2
	b.	Discuss how to implement stacks using linked list with examples.	08	L2	CO2
	c.	Define Queue. Discuss how to represent queues using dynamic arrays.	04	L2	CO2
		OR			
Q.4	a.	Write a recursive program to find out GCD of two numbers.	05	L3	CO2
	b.	What are the disadvantages of ordinary queue? Discuss the implementation of circular queue using array.	07	L2	CO2
	c.	Write a C – function to add polynomials. Show the linked list representation of below two polynomials. $p(x) = 3x^{14} + 2x^8 + 1$ $q(x) = 8x^8 - 3x^{10} + 10x^6$	08	L3	CO2

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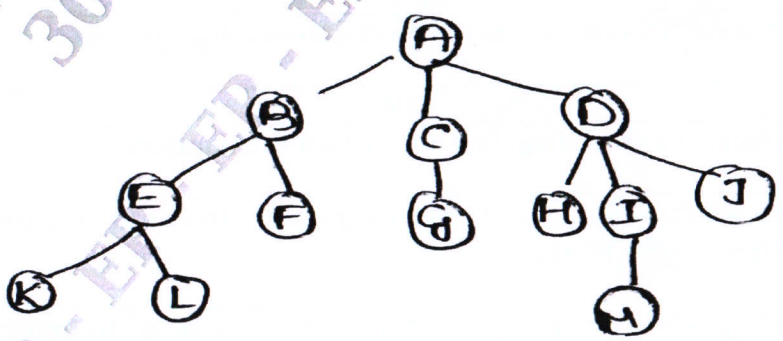
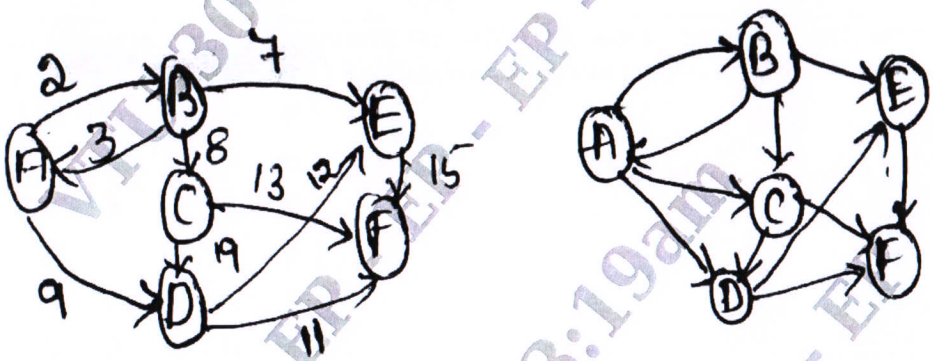
Module – 3

Q.5	a.	Write C function for the following. i) Inserting a node at the beginning of Doubly linked list. ii) Deleting node at the end of the Doubly linked list.	08	L3	CO3
	b.	List the rules to construct the threads. Write the routines for in – order traversal of a threaded binary tree.	06	L3	CO3
	c.	Explain Threaded Binary Tree in detail.	06	L2	CO3
		OR			
Q.6	a.	Write a function to perform the following using circular doubly linked list with header node. i) insert front → insert element at front end ii) delete rear → delete element from rear end.	10	L3	CO3
	b.	Define Binary Tree. Construct a Binary Tree for the following expression. ((6 + (3 – 2) * 5) 2 + 3.	10	L2	CO3
		Module – 4			
Q.7	a.	Construct the binary tree from the given traversal : Construct a binary tree having sequences : Preorder : ABDGCEHIF In order : **DGBAHEICF**	10	L3	CO4
	b.	Write a C function to evaluate an expression using expression tree.	10	L3	CO4
		OR			
Q.8	a.	Write an algorithm to construct binary tree for finding and checking for duplicate data. Trace the algorithm for the input: 14, 15, 4, 9, 7, 18, 3, 5, 16, 4, 20, 17, 9, 14, 5. Indicate a message for duplicate members.	07	L3	CO4
	b.	Draw a binary tree for the following expression 4 + 5 * (6 + 5) / 2 – 4 * (8 + 9 – 3). Traverse the above generated tree using in order, pre order and post order.	07	L2	CO4
	c.	Define Tree. For the given tree, explain terminologies and write the answer. i) Degree ii) Non terminal iii) Sibling iv) Ancestor v) Level vi) Height  	07	L2	CO4

Module – 5

Q.9	**a.**	What is Priority Queues? Demonstrate functions in C to implement the Max Priority queues with an example. i) Insert into the Max Priority queues ii) Delete into the Max Priority queues iii) Display Max Priority queues.	**10**	**L3**	**CO5**
	b.	Explain Hashing and Collision. What are the methods to resolve collisions?	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	What is Graph? Give matrix and adjacency list representation of graph. Show adjacency matrix and list for below graph.  	**10**	**L2**	**CO1**
	b.	Consider the following 4 – digit employee 9614, 5882, 6713, 4409, and 1825. Find 2 – digit hash address of each number using i) Division method with 97 ii) Mid square method iii) The folding without reversing iv) The folding with reversing.	**10**	**L3**	**CO5**

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