Total no. of Pages. 1 Roll no. .....

II Semester B. Tech. (Mid Semester Examination, May - 2023)

Course Code- CACSC02/CMCS04/COCSC02/CDCSC02

Course Title - Data Structures

Time- 1 Hr 30 Mins *Max. Marks- 15*

Note: Attempt All Questions. Missing data/Information if any may be suitably assumed

Q. No.	Question	Marks	CO
1a	What is a data structure? What is the need of having different data structures? Explain different types of data structures in detail.	1.5	CO1

1b	What is an algorithm? What are its properties? What is the cmplexity of the Program given below? Justify your answer/
	void fn(int n)
	{
	int i, j, k, count = 0;
	for(i = n/2; i <=n ; i++)
	for(j = 1; j + n/2 <= n ; j = j++)
	for(k = 1; k <= n ; k = k*2)
	count++;
	}
		1.5	

2a	What are the two ways in which two dimensional arrays can be stored in memory. Explain by taking suitable example	1	CO1, CO3
2b	(i) A 2 dimensional array defined as a[3..10,-1..5] requires four bytes of storage space for each element. calculate the address of element at a[8,2] using any of one form you mentioned in 2(a). Base address is 100 (ii) What is a sparse matrix. How the elements of sparse matrix are stored. Illustrate using an example.	1+1	
3a	What is a string? How it is declared and stored in the memory in C Language?	1	CO1, CO3
3b	Write a program in C language to compare two strings. You should not use any builtin functions	2	
4a	What is a linear Queue? What are its limitations? How these can be overcome. Write a C program to implement a linear queue using arrays	2	CO3
4b	What is stack? What are the operations you can perform on a stack. Also explain the overflow and underflow conditions of a stack.	1	
5a	Explain how a single array can be used to implement two stacks	1	CO3
5b	Write down the algorithm to convert an infix expression to postfix expression using stack. Using this algorithm convert the following infix expression into postfix expression : (A-b)*(C/D) + E. Show the changing status of stack in tabular form	2	

Total no. of Pages. 2 Roll no. .....

II Semester B. Tech. (End Semester Examination, May - 2023)

Course Code- CACSC02/CMCS04/COCSC02/CDCSC02

Course Title - Data Structures

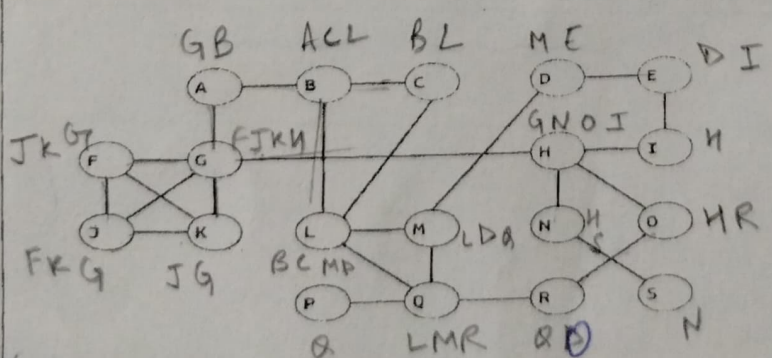
Time- 3 Hr *Max. Marks- 40*

Note: Attempt All Questions. Missing data/Information if any may be suitably assumed

Q. No	Question	Marks	CO
Q1	**Attempt any two parts of the Following**		

1a	(i) What is Asymptotic analysis? What are the guidelines for asymptotic analysis in a program for finding the time complexity
	(ii) What is the time complexity of following code
	`Function(int n) {`
	`int i = 1;`
	`while( i < n){`
	`int j = n;`
	`while(j > 0)`
	`j = j/2;`
	`i = 2 * i;`
	`}`
	`}`
		3+1	CO1

1b	(i) What is the difference between linear and Non Linear Data Stucture? (ii) What is Bubble Sort? Write the algorithm and Illustrate the sequence of steps for sorting following list of numbers in ascending order using bubble sort *100, 35, 12,78,23,200,45, 90,20, 67*	1+3	
1c	(i) Write a C function that returns a pointer to first occurrence of string S2 in String S1. Don't use built in functions (ii)A 2 dimensional array defined as T1[-20..10, -10..30] requires two bytes of storage space for each element. If the array is stored in row major form, calculate the address of element at T1[0,20]. Base address is 200	3+1	
Q2	**Attempt any two parts of the Following**		
2a	Write an algorithm to evaluate a postfix expression using stack. Illustrate the algorithm for the postfix expression abc/-de+*	4	CO2 CO4
2b	Given a queue of integers, rearrange the elements by interleaving the first half of the list with the second half of the list. For example, suppose a queue stores the following sequence of values: [11, 12, 13, 14, 15, 16, 17, 18, 19, 20]. Consider the two halves of this list: first half [11, 12, 13, 14, 15] and second half: [16, 17, 18, 19, 20]. These are combined in an alternating fashion to form a sequence of interleave pairs: the first values from each half (11 and 16), then the second values from each half (12 and 17), then the third values from each half (13 and 18), and so on. In each pair, the value from the first half appears before the value from the second half. Thus, after the call, the queue stores the following values: [11, 16, 12, 17, 13, 18, 14, 19, 15, 20]. Use Suitable data structures to solve the problem.	4	

2c	(i) What is Tower of Hanoi problem. Explain and write the algorithm for the same (ii) Write a C program to implement circular queue using arrays.	2+2	
Q3	**Attempt any two parts of the Following**		CO3 CO5
3a	(i) What is a Linked List? What are the advantages of linked list over arrays? (ii) How Linked list can be used for implementing addition of polynomials? Explain and write the algorithm	1+3	
3b	What are the advantages of double linked list over single linked list? Write a C program to create a double linked list so that data is entered in ascending order in the list.	1+3	
3c	(i) What is recursion? What are the key components of an algorithm design using recursion? Illustrate using an example (ii) Write a C program to binary search a number from an array of numbers using recursion	2 +2	
Q4	**Attempt any two parts of the Following**		CO3 CO5
4a	(i) What is a binary search tree? How binary search tree is created from a given set of values and how values are deleted from the binary search tree. Explain and Write the algorithm for the same. (ii) What are the different ways to traverse a tree. Illustrate by taking suitable example	2 +2	
4b	(i) What is an AVL tree. What are the different rotations performed in an AVL tree to balance the tree? (ii) For the given values create an AVL tree . Show rotation used at each step 2,1,4, 5, 9, 3, 6, 7, 16, 0	2+2	
4c	Write short notes on any two (i) Threaded binary trees (ii) Tries(iii) Hoffman algorithm	2+2	
Q5	**Attempt any two parts of the Following**		CO3 CO4
5a	(i) What is a Graph? Define (a) degree of node (b) directed graph(c) Regular Graph (d) Complete Graph (e) Path in a graph (f) Size of a Graph (ii) In how many ways graphs can be represented in Memory? Explain by taking suitable example	2+2	
5b	(i) Explain in detail insertion sorting technique by taking suitable example. (ii) What do you mean by breadth first search of a graph. For the following graph what will be the output using Breadth first search. Illustrate the steps  	2+2	
5c	Explain in detail any one algorithm for Topological sort of a Graph using suitable example	4	