U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

July 2023 Semester End Main Examinations

Programme: B.E. **Semester: VI**
Branch: Institutional Elective **Duration: 3 hrs.**
Course Code: 20IS6OEDSA **Max Marks: 100**
Course: Data Structures and Algorithms **Date: 07.07.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	*CO*	*PO*	Marks
1	a)	Define Data structures and discuss the differences between linear and non linear data structures.	*CO1*	*PO1*	**04**

	b)	Analyze the following code
		i) Specify how many bytes are allocated in the following code:
		char **a;
		if((a=malloc(10))!=NULL)
		{for(i=0;i<10;i++)
		a[i]=(char*) malloc(5);
		}
		
		ii) specify for a given linked list p, the function f returns 1 if and only if the elements in the list are _____
		
		struct item
		{ int data;
		struct item*next;};
		int f (struct item*p)
		{return((p==NULL)||(p->next==NULL)||(p->data<=p->next->data)&&(p->next)));
		}
			CO2	*PO4*	**04**

	c)	Give the node structure to create a singly linked list of integers and write the functions to perform the following: i) Create three node list with data 100, 200 and 300 ii) Insert a node with data values 25 in between the nodes having data values 100 and 200.	*CO4*	*PO2*	**06**
	d)	Develop a program to concatenate two linked lists.	*CO2*	*PO4*	**06**
		UNIT - II			
2	a)	Convert an infix expression ((a/(b-c+d))*(e-a)*c) to postfix form.	*CO4*	*PO1*	**06**
	b)	Define recursion. Write recursive function for finding i) factorial of a number ii)fibonacci series for n terms	*CO2*	*PO1*	**07**

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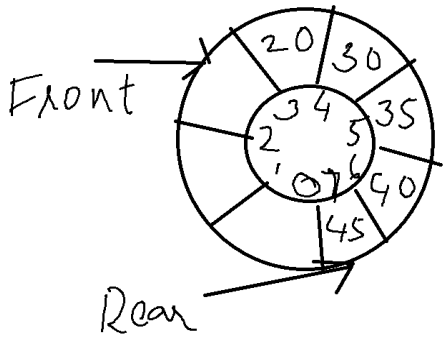
		c)	Implement a program to solve Tower of Hanoi puzzle recursively. The program should print all moves and also total number of moves taken to solve for n=3 disks.	*CO2*	*PO2*	**07**
			OR			
	3	a)	Develop a program to find the least positive integer in an integer queue of size N.	*CO2*	*PO2*	**06**
		b)	For the given circular queue shown below, write the values of front and rear in the table after each specified operation is performed. Queue full/empty conditions should be considered. 0-7 indicates array indicies  operation / Front / Rear Insert 0 Insert 10 Insert 15 Delete	*CO2*	*PO2*	**06**
		c)	List and explain different types of queues. Mention the applications of queue data structure. Also list the disadvantage of linear queue and explain how to overcome the disadvantage.	*CO1*	*PO1*	**08**
			UNIT - III			
	4	a)	Define Binary search tree. Write an algorithm to delete a node in binary search tree	*CO2*	*PO3*	**07**
		b)	What are Asymptotic notations, Explicate with example.	*CO1*	*PO1*	**06**
		c)	Construct a binary search tree for the following list of elements and traverse the constructed tree using inorder and postorder traversal methods. 100, 20, 5, 90, 120,110,15, 30, 55, 150, 10	*CO3*	*PO2*	**07**
			UNIT - IV			
	5	a)	Write an algorithm of bubble sort.	*CO3*	*PO2*	**07**
		b)	Trace selection sort on the following input and count the number of comparisons done: ALGORITHMS	*CO3*	*PO2*	**06**

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<table>
<tr><td></td><td></td><td>c)</td><td>Write the pseudocode of Merge sort algorithm (along with the merge.</td><td>CO3</td><td>PO2</td><td>07</td></tr>
<tr><td></td><td></td><td></td><td>OR</td><td></td><td></td><td></td></tr>
<tr><td></td><td>6</td><td>a)</td><td>Write an algorithm to traverse the graph using Breadth First Search.</td><td>CO4</td><td>PO2</td><td>07</td></tr>
<tr><td></td><td></td><td>b)</td><td>Discuss the source removal algorithm to obtain topological sort by considering an example.</td><td>CO2</td><td>PO1</td><td>06</td></tr>
<tr><td></td><td></td><td>c)</td><td>Write the pseudocode of the quick sort algorithm along with its partition.
Trace quicksort on this input 17,10, 23,45,8,12,54,75,13</td><td>CO3</td><td>PO2</td><td>07</td></tr>
<tr><td></td><td></td><td></td><td>UNIT - V</td><td></td><td></td><td></td></tr>
<tr><td></td><td>7</td><td>a)</td><td>Write an algorithm to construct a min heap using bottom up approach. Apply the same on the following input
2,9,7,6,5,8</td><td>CO4</td><td>PO1</td><td>07</td></tr>
<tr><td></td><td></td><td>b)</td><td>Analyze the algorithm for computing Binomial coefficient C[n,k] using dynamic programming approach. Draw the binomial coefficient table for (8,3)</td><td>CO4</td><td>PO1</td><td>07</td></tr>
<tr><td></td><td></td><td>c)</td><td>Apply the bottom up dynamic programming algorithm to the following instance of Knapsack problem, along with the steps.

<table>
<tr><th>Item</th><th>weight</th><th>value</th></tr>
<tr><td>1</td><td>2</td><td>Rs 5</td></tr>
<tr><td>2</td><td>1</td><td>Rs 6</td></tr>
<tr><td>3</td><td>2</td><td>Rs 18</td></tr>
<tr><td>4</td><td>3</td><td>Rs 22</td></tr>
<tr><td>5</td><td>4</td><td>Rs 28</td></tr>
</table>
Capacity W=6</td><td>CO1</td><td>PO1</td><td>06</td></tr>
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