U.S.N.										

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

Autonomous Institute Affiliated to VTU

April 2024 Semester End Main Examinations

Programme: B.E. **Semester: III**
Branch: Computer Science and Engineering **Duration: 3 hrs.**
Course Code: 22CS3PCDST **Max Marks: 100**
Course: Data Structures

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

			CO	PO	Marks
		UNIT - I			
1	a)	Compare Linear and Non-Linear Data structures in terms of types, implementation, memory and applications.	CO1	PO1	**06**
	b)	Represent the usage of stack to convert the given infix expression to postfix expression. Expression: **A+B*(C^D-E)^(F+G*H)-I.**	CO1	PO2	**08**

	c)	Trace the recursive function given below and write the output generated by the function.
		
		`int fun(int a, int b)`
		`{`
		`  if (b == 0)`
		`  return 0;`
		`  if (b % 2 == 0)`
		`  return fun(a+a, b/2);`
		
		`  return fun(a+a, b/2) + a;`
		`}`
		
		`int main()`
		`{`
		`  printf("%d", fun(4, 3));`
		`  return 0;`
		`}`
			CO1	PO2	**06**

		UNIT - II			
2	a)	Assume that you are implementing an application using queue you need to dynamically allocate memory for the same. Write a C function to allocate 20 bytes of single block of memory. Display appropriate messages during allocation of memory to indicate if the memory allocation was success or failure.	CO1	PO2	**06**
	b)	Assume that you are assigned a task of developing a print job management system for a busy office. When a department wants to	CO1	PO2	**08**

			print a document, it submits a print job to the system. The print jobs are added continuous in a circular fashion and the order of submission determines the order in which they will be printed. The printer processes one job at a time. When a print job is completed, the next job sent to the printer for processing. What data structure would you choose to implement to efficiently handle the printing request? The program should display necessary messages when there is no sufficient space to hold the new request and there is no more task to be printed.			
		c)	Develop a C program to implement a queue to insert and delete 5 elements in FIFO fashion and find the sum and average of all the elements inserted into the queue.	*CO1*	*PO2*	**06**
			UNIT - III			
	3	a)	Develop a C program to generate a metro ticket from one place to another which includes the following information, passenger_no, source, destination, and price using a singly linked list. The program should include the following functionality a) Add tickets purchased in the singly linked list. b) Count the no. of passengers travelling and display the details of the passengers.	*CO2*	*PO2*	**08**
		b)	Consider that you are tasked with implementing a doubly linked list to manage student records in a university database. Each student record contains the student's name, ID, and GPA. Write the C function that allows the following operations: a. Insert a new student record at the beginning of the list. b. Delete a student record by ID.	*CO2*	*PO2*	**06**
		c)	Develop a C program to implement Push and Pop Operation using singly linked list.	*CO2*	*PO2*	**06**
			OR			
	4	a)	Develop a C program to create a singly linked list to store the details in the super market with the following details, customer ID, customer phone_no, items_purchased, Total_amount. a) Write a function to insert the customer details in the beginning. b) Generate a bill for each customer displaying the details mentioned above.	*CO2*	*PO2*	**08**
		b)	Consider that you are adding a functionality used in switching between applications and programs (Alt + Tab) in the Operating system implement the same using Circular Linked List.	*CO2*	*PO2*	**06**
		c)	Define a Sparse Matrix. Write a C function to show how linked list can be used to represent the Sparse matrix.	*CO2*	*PO2*	**06**
			UNIT-IV			
	5	a)	Define the following terms with examples: a) Degree b) height c) Level d) depth e) child and siblings	*CO3*	*PO1*	**10**

		b)	Develop a C program to construct a binary search tree and display the inorder, preorder and postorder traversals for the given values and search for any given key value given in the tree. 28, 24,38,31,45,20,25	*CO3*	*PO2*	**10**
			OR			
	6	a)	Explain the following with examples for each: a) Rooted Binary tree b) Fully strictly Binary tree c) Complete perfect binary tree d) Almost complete binary tree e) Skewed binary tree.	*CO3*	*PO1*	**10**
		b)	Develop a C program to construct the binary search tree and delete a node from the tree that has two child nodes.	*CO3*	*PO2*	**10**
			UNIT - V			
	7	a)	Analyze the process of inserting the given sequence of keys into a hash table using separate chaining and the hash function 'key mod 10'. The keys provided for insertion are: 50, 700, 76, 85, 92, 73, and 101. Show each element insertion separately.	*CO3*	*PO2*	**05**
		b)	Consider inserting the keys 24, 36, 58,65,62,86 into a hash table of size m=11 using linear probing and quadratic probing, consider the primary hash function for linear probing is h' (k) = k mod m and the hash function for quadratic probing to be h (k, i) = [k mod m + i^2] mod m, Here C_1=1, C_2=3	*CO3*	*PO2*	**08**
		c)	Construct a Hash table for the following numbers: 79, 69, 98, 72, 14, 50, Show how collision is resolved using Extendible Hashing with each step demonstrated clearly. Consider bucket limit=13.	*CO3*	*PO2*	**07**

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