Academic year 2021-2022 (ODD Sem)

DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

Date	Nov 2021	Maximum Marks	50
Course Code	18IS33	Duration	90 Min
Sem	III Semester	Test-I	
DATA STRUCTURES AND ITS APPLICATIONS			

Course Outcomes:

Sl. No.	Questions	M	BT	CO
1a	Considering only the characters '(' and ')', a sequence of parentheses is called regular if it follows the following definition: • An empty sequence is regular • If S is a regular sequence, then (S) is also regular • If A and B represent two regular sequences, then their concatenation AB is also regular. Therefore, the sequences ( ), ( ) ( ) and (( )) ( ) are regular, while ( ) (( ) and)) ( ) are non-regular. Write a C function/algorithm using stack to find if the sequence is regular or not. Trace your algorithm for the input sequence ((( ))) ( ) and (( )))) ( )	5 + (3 + 2) = **10**	3	3
2	Design an algorithm using stack to convert a given infix expression (without parenthesis) into a postfix expression. Give details of any supplementary functions used. Using the same convert the following infix to postfix. Show each step of the conversion: A+B/C*D-A^F^H	6 + 4 = **10**	3	3
3	Implement a C program to solve the Tower of Hanoi puzzle recursively. The program should print all the moves and also the total number of moves taken to solve. Trace your strategy for n = 4 disks. (Write the moves)	5 + 5 = **10**	3	4
4	Identify the limitation/s of array implemented simple queue. Discuss the possible ways to overcome this limitation? Write an efficient pseudo code for the queue primitive operations.	2 + 2 + 6 = **10**	2	2
5a	Write a C program to find the size of the file	**5**	3	1
5b	Write an algorithm using stack to evaluate a given valid **prefix** expression.	**5**	2	1

Academic year 2021-2022 (ODD Sem)

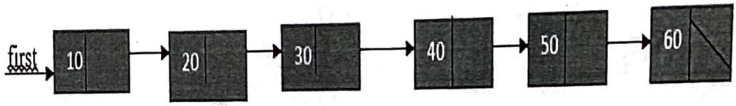
DEPARTMENT OF
INFORMATION SCIENCE & ENGINEERING

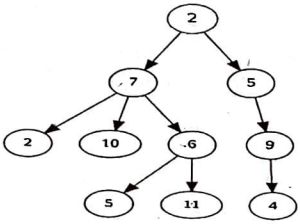
Date	3rd JAN 2021	Maximum Marks	50+10
Course Code	18IS33	Duration	110 Min
Sem	III Semester	CIE-II	
DATA STRUCTURES AND ITS APPLICATIONS			

Sl. No.	Questions	M	BT	CO
	PART A			
1.1	What does the function "fun" print for a given singly linked list with contents as (1, 3, 5, 7, 9, 11, 13, 15, 17, and 19) and with first node pointed by external pointer "head"? (NOTE: write only the value printed) `struct node{ int data; struct node *next; }; void fun(struct node *head){ if(head != NULL) { struct node *q; q = head; while(q->next->next != NULL){ q = q->next; } printf("%d", q->data); } }`	2	4	2

1.2	Consider, the size of int data type is 4 bytes and the linked list node is defined as follows:
	`struct node{ int *num; struct node *next; };`
	What is the number of bytes allocated after executing the following statement:
	`p = (struct node *)malloc(sizeof(struct node *));`
	(NOTE: write only the value)
		2	2	1

1.3	Consider the below given list and the following algorithm statements are executed in sequence of numbering given. what is the value printed after
	`struct node *p;`
	`p= first->next->next->next;` 10→20→30→40
	`p->next->next->next->next= first->next->next;` 40→50→60 null = 30
	`first->next->next= p->next->next->next;` 30 = NULL
	`print( p->next->next->next ->next->next->next->next->next->data);`
		2	4	3



1.4	Construct an expression tree for the following expression (a+b*c)+(d*r+f)*(g-h)	2	3	4
1.5	Consider the following binary tree, answer the following i)What is the height of the node 7 ii) List the common ancestors of node 10 and 11 iii) what is the depth of a node 6 iv)what is the level of the node 9  	2	2	1
	PART B			
2a.	Develop C functions to perform the following operations on a singly linked list 1. Replacing all nodes which have the data 'x' by 'y'. 2. Create an ordered list. **(Note : A list of n nodes such that $N_i <= N_{i+1}$ for all 1<i<n-1is called an ordered list)**	7	4	3
2b.	Explain with syntax any two dynamic memory allocation functions.	3	2	1
3a.	Develop C functions to implement push, pop and display of a stack using circular linked list. **(Note : Discard overflow and underflow condition)**	7	3	2
3b.	Write a C function to reverse a circular singly linked list with header node.	3	4	3
4a.	Imagine that N people have decided to elect a leader by arranging themselves in a circle and eliminating every K^{th} person around the circle, till one person remains, who becomes the leader. Given the values for N and K and the count should begin from 1^{st} person, Write the necessary pseudocode using circular linked list to determine the order in which people are eliminated from the circle and which person becomes the leader. Trace the code with an example.	7	4	3
4b.	For the problem stated in **Question 4a**, Write a recursive solution.	3	4	2
5a.	Write necessary C function to 1. Perform Iterative preorder on a binary tree. 2. Count the number of leaf nodes in a binary tree.	7	4	3
5b.	Develop a C function on a doubly linked list to insert a new node at a given position.	3	3	3
6a.	Construct a binary Search tree by inserting the keys **6,4,22,10,2,14,3,8,11.** Traverse the constructed tree in preorder, inorder and postorder.	7	3	4

6b.	Define the following terms with necessary diagrams 1. Height of a tree 2. Almost complete binary tree. 3. Strictly binary tree.	**3**	1	4

Course Outcomes:

CO1 : Understand and explore the fundamental concepts of various data structures.
CO2 : Analyze and represent various data structures.
CO3 : Design algorithms on different data structures like Stack, Queue, List, Tree and hashing.
CO4 : Implement programs with suitable data structure based on the requirements of the application.

BT-Blooms Taxonomy, CO-Course Outcomes, M-Marks

Marks Distribution	Particulars		CO1	CO2	CO3	CO4	L1	L2	L3	L4	L5	L6
	Test	Max Marks	07	14	29	12	03	03	19	34	-	-

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RV Educational Institutions
RV College of Engineering
Autonomous Institution Affiliated to Visvesvaraya Technological University, Belagavi
Approved by AICTE, New Delhi

Academic year 2021-2022 (ODD Sem)

DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

Date	16th March 2022	Maximum Marks	10+50
Course Code	18IS33	Duration	110 Min
Sem	III Semester	CIE-III	

DATA STRUCTURES AND ITS APPLICATIONS

Sl. No.	Questions	M	BT	CO
	PART A			
1.1	What traversal over Trie gives lexicographical sorting of a set of strings?	01	L2	CO2
1.2	Suppose that you insert a set of N strings into a Trie. What determines the shape of the Trie?	01	L2	CO2
1.3	Give one example for Zag-Zig rotation in a Splay tree.	01	L2	CO2
1.4	Mention any two applications of Splay tree.	01	L2	CO2
1.5	B+ tree can contain a maximum of 7 pointers in a node. What is the minimum number of keys in leaves?	01	L2	CO2
1.6	What is the maximum number of keys that a B+ -tree of order 3 and of height 3 have?	01	L2	CO2
1.7	A left-in threaded binary search tree is constructed for the following list of numbers: {40, 35, 70, 30, 39, 20, 34, 10, 5, 11}. Write the inorder traversal for the constructed tree	02	L3	CO2
1.8	The keys 10, 40, 20, 30, 100, 200 are inserted into the empty hash table of length 10 with hash function H (i)=i^2 mod 10. What is the maximum probe value for the resultant hash table?	02	L3	CO2
	PART B			
2.a	Compare Binary tree, Splay tree, Skew binary tree and Binary search tree	05	L3	CO2
2.b	Construct Trie for keys: {betty, bought, some, butter, but, the, was, bitter}	05	L3	CO1
3.a	Appraise B+ tree as a tree-based data structure.	05	L2	CO1
3.b	Construct AVL tree for keys: 11, 12, 13, 14, 15, 16, 17. Each step of the construction must be shown.	05	L3	CO2
4.a	Design an iterative routine for inorder traversal of a right in-threaded binary tree	05	L4	CO4
4.b	Construct a double threaded binary search tree for the following keys: 10, 5, 14, 4, 7, 12, 15, 6, 9, 8	05	L3	CO2
5	List the properties of a binary heap. For the given elements construct a min heap using top-down approach (show the steps clearly): 54, 26, 93, 17, 77, 31. For the above constructed min heap, perform the Extractmin operation once and write the tree after the deletion.	10	L3	CO2
6.	Compare linear probing with separate chaining collision resolution technique. Construct the hash table for the keys: 54, 26, 93, 17, 77, 31, that are inserted one after the other into the empty hash table of length 11 using linear probing with hash function (**h(key) = key² % 11**)	10	L3	CO3