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RV COLLEGE OF ENGINEERING
Autonomous Institution affiliated to VTU
III Semester B.E. April -2024 Examinations
DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING
DATA STRUCTURES AND APPLICATIONS
(2022 SCHEME)

Time: 03 Hours**Maximum Marks: 100****Instructions to candidates:**

1. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
2. Answer FIVE full questions from Part B. In Part B question number 2 is compulsory. Answer any one full question from 3 and 4, 5 and 6, 7 and 8, and 9 and 10.

PART-A

1	1.1	List any four applications of stack data structure	10*2 M=2 0
	1.2	Bojo got the prefix expression $*+2-21/-42+-531$ to evaluate. Help him with the answer.	
	1.3	If $- * + R V C E = 11$, find value of E using evaluation of prefix algorithm. $R=1, V=2$, and $C=5$	
	1.4	If the function is called always with a value greater than 10 and less than 50 then the parameter X in the recursive step can be replaced by <pre> iInt fun(int n) { int result; if (n == 100) return 1; result = fun(X) + 1; return result; } </pre>	
	1.5	A binary search tree is generated by inserting in order the following integers: 50, 15, 62, 5, 20, 58, 91, 3, 8, 37, 60, 24 The number of nodes in the left subtree and right subtree of the root respectively is ____ and ____	
	1.6	$R = \text{malloc}(\text{sizeof}(\text{struct node}))$ in this expression what should be written before malloc for appropriate type casting	
	1.7	A hash function h defined $h(\text{key}) = \text{key} \bmod 7$, with linear probing, is used to insert the keys 44, 45, 79, 55, 91, 18, 63 into a table indexed from 0 to 6. What will be the location(index) of key 18?	

1.8	<p>If the following expression is represented as expression tree</p> $a+b*(c-(d/e)^f)-g/h$ <p>then the operator present in the root node of the expression tree is _____</p>	
1.9	<p>what will be the value returned by the following function, when it is called with a value 11?</p> <pre> Fun(int num) if ((num/2) !=0) return (Fun(num/2) * 10 + num%2); else return 1; </pre>	
1.10	<p>Consider the malloc statement: <code>float * r = (float *) malloc (n* sizeof(float));</code></p> <p>The equivalent realloc function statement is _____</p>	

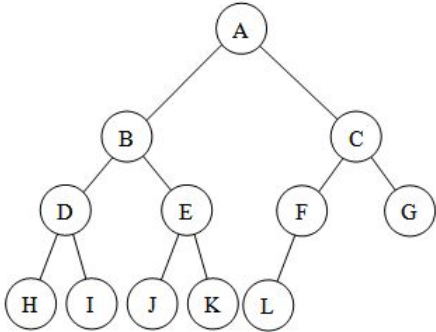
PART-B

UNIT-I			
2	a	Write the recursive call tree to explain the recursion to solve Tower of Hanoi problem (number of disc=4)	8
	b	<p>Write the algorithm to convert infix expression to postfix form. Apply the same on the given expression. Give the steps showing the content of stack and input array and output array.</p> $(u+b*c\%m-p)-((d+e\$f)\$g)+h\$x/y$	8

UNIT-II			
3	a	Write C function for inserting & deleting an element in sequential QUEUE.	8
	b	Apply all dynamic memory allocation library functions and write a C program to find the largest elements in an array	8
		OR	
4	a	<p>Give a node structure to create a singly linked list of integers and write a C functions to perform the following:</p> <p>i) Create a three node list with data 45,72,34 and 300</p> <p>ii) Insert a node with the data value 150 in between the nodes having data values 34 and 300.</p> <p>iii) Delete the node whose data is 34</p>	8
	b	What are the advantages of Circular queue over a linear queue? Write C routines for	8

		insert, delete and Display of circular queue.	
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UNIT-III			
5	a	<p>List the advantages of a circular linked list? consider a circular linked list without header node, write an algorithm to perform following operations</p> <p>i) Inserting At Specific location in the list</p> <p>ii) Deleting a Specific Node from the list</p>	8
	b	Write a C program to implement addition of two polynomials using doubly linked list.	8
OR			
6	a	Write “C” a function to insert an element in to binary search tree .	6
	b	Write the advantage and disadvantage of doubly linked list over singly linked list.	4
	c	Write a function to check whether the given tree is a strictly binary tree or not.	6

UNIT-IV			
7	a	Write the Pseudocode for heapsort and Illustrate with an example	8
	b	<p>Write an algorithm to Generate Expression Tree from parentheses-free infix arithmetic expression and apply the same on the following input to show the stack content after processing each input character in the process.</p> <p>A + B % C \$ E – F / EA + B % C \$ E – F / E</p>	8
OR			
8	a	<p>Write a C function to print the number of leaves in a binary tree and apply inorder, preorder and postorder tree traversal on the following binary tree.</p>  <pre> graph TD A((A)) --- B((B)) A --- C((C)) B --- D((D)) B --- E((E)) C --- F((F)) C --- G((G)) D --- H((H)) D --- I((I)) E --- J((J)) E --- K((K)) F --- L((L)) </pre>	
	b	Give a node structure and write iterative algorithm to perform inorder, preorder and	

		postorder traversal of a binary search tree.	
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UNIT-V			
9	a	Compare linear probing with separate chaining collision resolution technique. Construct the hash table for the keys: 58 21. 93, 17, 88, 30, that are inserted one after the other into the empty hash table of length 11 using linear probing with hash function ($h(\text{key}) = \text{key}^2 \% 11$)	8
	b	Construct a double threaded binary search tree for the following keys: 19, 5, 18, 4, 7, 11, 15, 6, 9, 80	8
		OR	
10	a	The keys 1, 3 ,12, 4, 25, 6, 18 ,20, 8 are inserted into the empty hash table of length 10 using linear probing with hash function $H(i) = i^2 \bmod 10$. What is the resultant hash table and find the maximum probe value?	8
	b	For the given set of elements construct a B+ tree of order 3 by storing a copy on the left and duplicate keys should not be inserted DATA STRUCTURES	8