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RV COLLEGE OF ENGINEERING®

(An Autonomous Institution affiliated to VTU)

III Semester B. E. Examinations April - 2022

COMMON FOR ISE/CSE

DATA STRUCTURES AND ITS APPLICATIONS

Time: 03 Hours *Maximum Marks: 100*

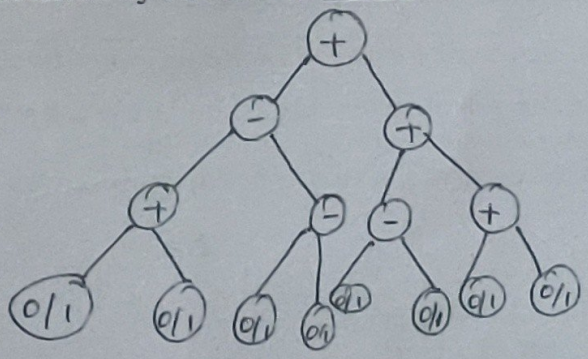
Instructions to candidates:

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, 7 and 8 are compulsory. Answer any one full question from 3 and 4 & one full question from 5 and 6.

PART-A

1	1.1	Write recursive C function to print the array elements.	02
	1.2	Consider the malloc statement: $float * r = (float *) malloc(n * sizeof(float));$ Write the equivalent realloc function statement.	02

	1.3	What does the following function do for a given singly linked list with first node as start?
		`void fun(struct node * start)`
		`{ if(start == NULL) return;`
		`fun(start → next);`
		`printf("%d", start → data);`
		`}`
			02

	1.4	The postorder traversal of a binary tree is 8,9,6,7,4,5,2,3,1. The inorder traversal of the same tree is 8,6,9,4,7,2,5,1,3. What will be the height of the binary tree?	02
	1.5	Consider the expression tree shown in Fig 1.5. Each leaf represents a numerical value which can either be 0 or 1. Over all possible choices of the values at the leaves, the maximum possible value of the expression represented by the tree is _____.  Fig 1.5	02
	1.6	Consider the following array elements. 90, 150, 67, 54, 9, 70, 45, 21, 7, 200 which are stored from the array index 1. What will be the position of the element 45 after creation of max heap using bottom-up method?	02

	1.7	The postfix expression with single digit operands is evaluated using a stack 8 2 3 ^ / 2 3 * +5 / * − Note that ^ is the exponentiation operator. The two elements of the stack after the first * is evaluated are _____ and _____.	02
	1.8	How many rotations are required during construction of an AVL tree if the following elements are added in order given? 35, 50, 40, 25, 30, 60, 78, 20, 28	02
	1.9	What is the idea of threaded binary tree?	02
	1.10	The return value of malloc function is _____.	01
	1.11	_____ modifier flag is used to create a new file for openAPI.	01

PART-B

2	a	Write the C function to solve towers of Hanoi problem and write the recursive call tree to solve when number of disks are 3.	08
	b	Write an algorithm to evaluate the postfix expression using stack and apply the infix to postfix conversion algorithm on the following infix expression. (2+3) * 4^5^6 − 7	08
3	a	What are the advantages of circular queue over ordinary queue? Write a C program to simulate the working of circular queue of integers using array. Provide the following operations: i. Insert ii. Delete iii. Display	08
	b	What is dynamic memory allocation? Write a C program to illustrate the usage of DMA C functions to allocate the initial memory by malloc and reallocate using realloc and finally deallocate the allocated memory and explain each DMA function.	08
		OR	
4	a	Write a C function to reverse a singly linked list.	05
	b	Write the syntax for the following DMA functions. i. malloc() ii. calloc() iii. realloc()	03
	c	Write the C program to demonstrate linked list based implementation of linear queue.	08
5	a	Write a C function for the concatenation of two doubly linked lists.	03
	b	What are the advantages of circular linked list? Write a C function to delete a node at end of a circular linked list.	05
	c	With a neat diagram, explain deletion in binary search tree.	08
		OR	
6	a	Define the following terms: i. Height of a tree ii. Almost complete binary tree.	04
	b	Write a C function to perform polynomial addition using a linked list.	06
	c	Develop a C function on a doubly linked list to insert a new node at a given position.	06

7	a	Write an algorithm to generate expression tree from an infix expression.	06
	b	Given the initial empty AVL tree, apply the following operations in sequence. List the rotations required and balance the AVL tree after each operation. Show the steps. Insert(50), Insert(20), Insert(10), Insert(80), Insert(70), Insert(75).	06
	c	Write the C function to perform preorder traversal on threaded binary tree.	04
8	a	Write an algorithm to construct a heap using bottom up approach.	06
	b	Apply quadratic probing to insert the keys 6,4,9,11,13,10,20,40,14 into the empty hash table of length 10 with hash function H(k)=2k+3%10. Show the structure of the hash table and what is the probe sequence to search for the key element 14?	04
	c	For the given elements, construct a min heap using bottom-up approach. 9, 70, 45, 21, 7, 20, 10, 15, 4 And perform extract min operation thrice on the constructed tree and write the tree after each deletion.	06