C.M.R. INSTITUTE OF TECHNOLOGY
CMR
BANGALORE - 37

CBCS SCHEME

USN:

18CS32

Third Semester B.E. Degree Examination, June/July 2023
Data Structures and Applications

VTU-02-08-2023 01:07:34pm
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Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Explain with block schematic various types of data structures along with examples. Also list out various basic operations that can be performed on data structures. **(10 Marks)**

b. Define sparse matrix. Express the given matrix in sparse representation, triplet form and transpose.

$$\begin{bmatrix} 0 & 0 & 0 & 0 & 9 & 0 \\ 0 & 8 & 0 & 0 & 0 & 0 \\ 4 & 0 & 0 & 2 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 5 \\ 0 & 0 & 2 & 0 & 0 & 0 \end{bmatrix}$$

(10 Marks)

OR

2 a. Explain the following dynamic memory allocation functions along with syntax and example:
(i) Malloc (ii) Calloc (iii) realloc (iv) free **(10 Marks)**

b. Outline the prefix function of Knuth Morris Pratt algorithm. Also implement the same to find the occurrence of the following pattern P in main string S.
S : B A C B A B A B A B A C A C A
P : A B A B A C A **(10 Marks)**

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Module-2

3 a. Write a C program to perform push ( ), pop( ), display operation on STACK. **(10 Marks)**

b. Outline the algorithm for convert an infix expression to postfix one using the same algorithm, convert the following infix expression to postfix expression.
((A * (B + D) | E) – F * (G + H | K))) **(10 Marks)**

OR

4 a. Write a C program to perform insertion, deletion and display operation on queue. **(10 Marks)**

b. Outline algorithm for evaluation of a valid postfix expression. Evaluate the expression ab + cd + *e/. Let a = b = c = d = e = 4. **(10 Marks)**

Module-3

5 a. Write C function for :
(i) Inserting a node at the beginning of single linked list
(ii) Inserting a node at the end of single linked list **(10 Marks)**

b. Explain concept of sparse matrix representation using linked list. Represent the following sparse matrix in linked list format.

A =

0	0	3	0	4
0	0	5	7	0
0	0	0	0	0
0	2	6	0	0

(10 Marks)

OR

6 a. Write C functions for:
(i) Concatenation of single linked list
(ii) Reverse a single linked list. **(10 Marks)**

b. Write C function to add two polynomials. Show the linked list representation of the below two polynomials and its addition.
P1 : $5x^2 + 4x + 2$
P2 : $5x + 5$
O/P : $5x^2 + 9x + 7$ **(10 Marks)**

Module-4

7 a. Write recursive C routine for preorder, inorder and postorder traversals of a tree. Also find all the three transversal of the following tree.

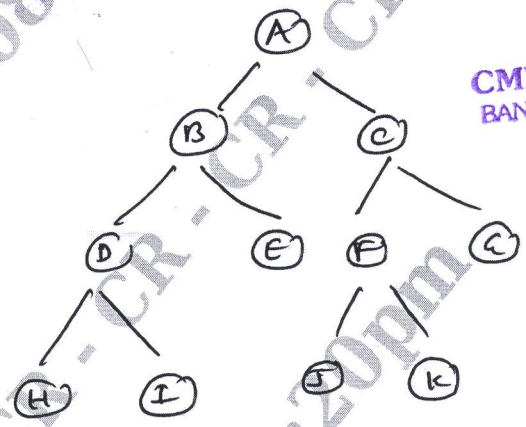

Fig.Q7(a) **(10 Marks)**

b. Draw a binary search tree for following input of elements:
43 10 79 90 12 54 11 9 50
Also write a C function to search for an element in BST. **(10 Marks)**

OR

8 a. Define threaded binary tree. Explain one way and two way threaded binary tree. Represent the following tree in the form of one way and two way threaded binary tree.

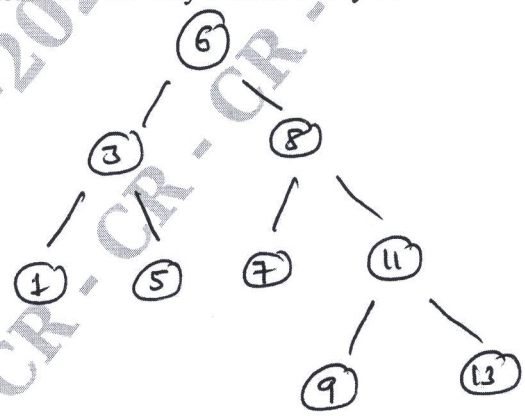

Fig.Q8(a) **(10 Marks)**

b. Outline the steps involved in construction of an expression tree. Construct expression tree for the following input : A B + C * **(10 Marks)**

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Module-5

9 a. Explain the following representation of graph:
(i) Adjacency matrix (ii) Edge list (iii) Adjacency list
Represent the following graph in above style.

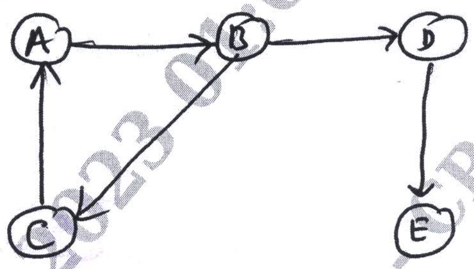

Fig.Q9(a) **(10 Marks)**

b. Arrange the following elements in ascending order using Radix sort:
143, 74, 875, 342, 23, 477, 17, 689, 128, 87 **(10 Marks)**

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OR

10 a. Explain hashing and collision. What are methods to resolve collision? Provide example for each. **(10 Marks)**

b. Write algorithm for DFS and BFS traversal for a given graph G = (V, E). **(10 Marks)**

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