

CBCS SCHEME

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18CS32

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

Time: 3 hrs.

Max. Marks: 100

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

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)

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.

$$A = \begin{bmatrix} 0 & 0 & 3 & 0 & 4 \\ 0 & 0 & 5 & 7 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 2 & 6 & 0 & 0 \end{bmatrix}$$

(10 Marks)

OR

- 6 a. Write C functions for:
- Concatenation of single linked list
 - 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.

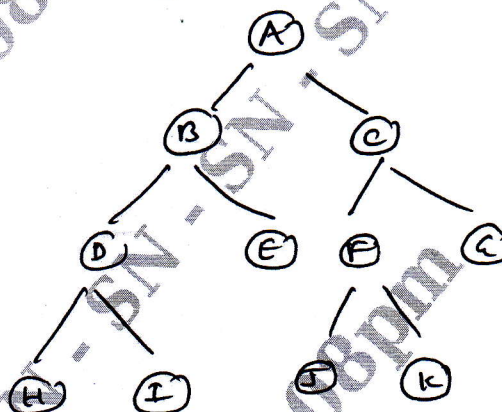


Fig.Q7(a)

- 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.

- 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.

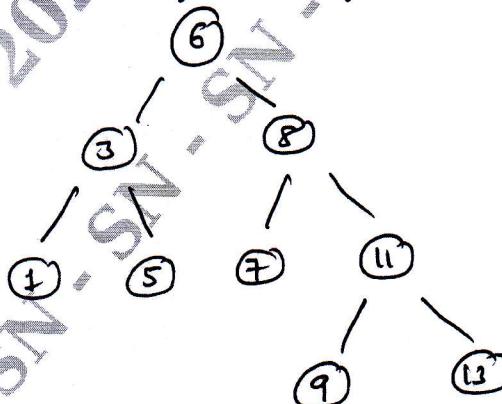


Fig.Q8(a)

- b. Outline the steps involved in construction of an expression tree. Construct expression tree for the following input : $A B + C *$

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.

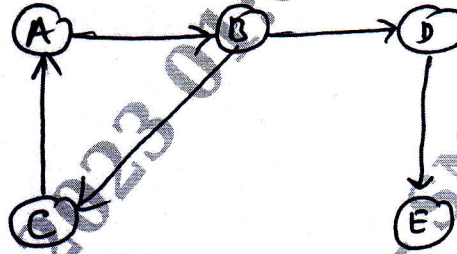


Fig.Q9(a)

(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)

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)
