

# CBCS SCHEME

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## 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)

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.

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. (10 Marks)  
 $P1 : 5x^2 + 4x + 2$   
 $P2 : 5x + 5$   
 $O/P : 5x^2 + 9x + 7$

**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.

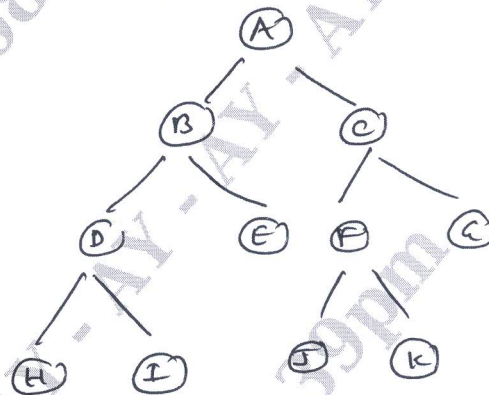


Fig.Q7(a)

(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.

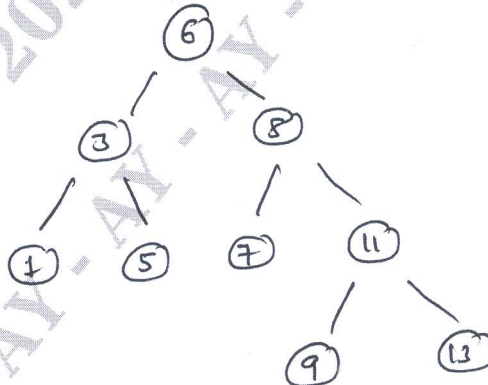


Fig.Q8(a)

(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)

**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.

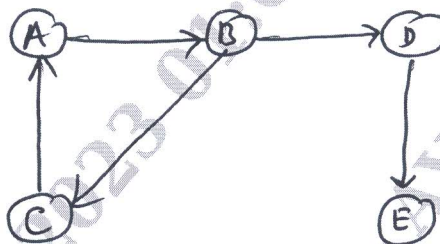


Fig.Q9(a)

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

(10 Marks)

(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)

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