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## Third Semester B.E. Degree Examination, June/July 2019 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. Define Data structures. Give its classification. What are the basic operations that can be performed on data structure? (08 Marks)
- b. Give the ADT for sparse matrix. Express the given sparse matrix in the triplet form and find its transpose.

$$A = \begin{bmatrix} 10 & 0 & 0 & 25 & 0 \\ 0 & 23 & 0 & 0 & 45 \\ 0 & 0 & 0 & 0 & 32 \\ 42 & 0 & 0 & 31 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 30 & 0 & 0 \end{bmatrix}$$

(08 Marks)

- c. Consider the given 2 polynomials,  
 $A(x) = 4x^{15} + 3x^4 + 5$  and  $B(x) = x^4 + 10x^2 + 1$   
 Represent the polynomials using Array of structures. (04 Marks)

OR

- 2 a. Explain the dynamic memory allocation functions in detail. (08 Marks)
- b. Write a C program using pointers to (i) Concatenate two strings, (ii) reverse a string. (06 Marks)
- c. Apply Knut-Morris-Pratt (KMP) pattern matching algorithm to search the pattern "abcdabcy" in the text "abcxabcdabxabcdabcbcdabcy". (06 Marks)

### Module-2

- 3 a. Define stack data structure and give the ADT for stack. Write C functions for push( ) and pop( ) operations. (08 Marks)
- b. Convert the given infix expressions to postfix and prefix expression.  
 (i)  $(a + b) * d + e / (f + g * h) + i$   
 (ii)  $((a / (b - c + d)) * (e - f) * g)$  (06 Marks)
- c. Write an algorithm for evaluation of postfix expression. Trace the same for the expression  $ab/c - de * t ac * t$  where  $a = 6, b = 3, c = 1, d = 2, e = 4$ . (06 Marks)

OR

- 4 a. Define recursion. Write C recursive functions for the following :  
 (i) Tower of Hanoi (ii) Factorial of a give number. (07 Marks)
- b. Write C functions for insertcq( ) and deletcq( ) operations on a circular queue. (05 Marks)
- c. Explain in detail multiple stacks, with relevant functions in C. (08 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.

**Module-3**

- 5 a. Define linked lists. Explain in detail, the primitive operations performed on Supply Linked List (SLL). List the different types of linked lists. (12 Marks)
- b. Write C functions for the following operations on Doubly Linked List (DLL). (08 Marks)
- (i) Concatenation of two DLL.
  - (ii) Search the DLL for the given key element.

**OR**

- 6 a. Write a C program to implement linked stacks. (08 Marks)
- b. Write an algorithm to add 2 polynomials using circular simply linked list (SLL). And also represent the given polynomial using CSLL. (08 Marks)
- $$P(x, y, z) = 6x^2y^2z - 4yz^5 + 3x^3yz + 2xy^5z - 2xyz^3$$
- c. For the given sparse matrix give the linked list representation. (04 Marks)

$$A = \begin{bmatrix} 0 & 0 & 4 & 0 & 0 \\ 6 & 5 & 0 & 0 & 0 \\ 0 & 3 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 2 \end{bmatrix}$$

**Module-4**

- 7 a. Define tree data structure. Represent the tree given in Fig.Q7(a) using (i) List representation (ii) Left-Child Right-Sibling representation (iii) Degree-two or Binary tree representation.

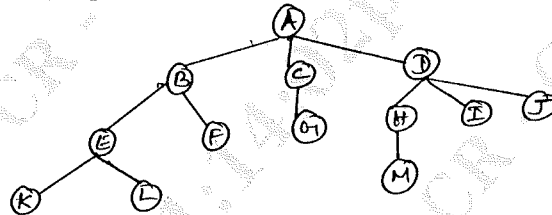


Fig.Q7(a)

- b. Write recursive C functions for in-order, pre-order, post-order traversals of binary tree (BT). Also give the 3 traversals for the BT shown in Fig.Q7(b). (12 Marks)

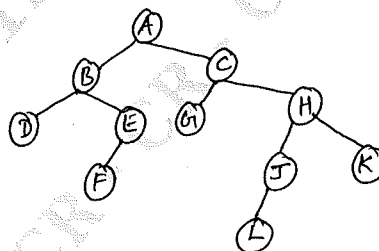


Fig.Q7(b)

**OR**

- 8 a. Define Binary Search Tree (BST). Construct BST for the element step-by-step, 100, 85, 45, 55, 110, 20, 70, 65, 113, 145, 132, 96 (08 Marks)
- b. Define threaded binary trees. Given in-order sequence: DJGBHEAFKIC and post-order sequence : JGDHEBKIFCA, construct BT for the same. (08 Marks)
- c. Write an algorithm for deleting a key element from BST. (04 Marks)

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**Module-5**

- 9 a. Define the terminologies with example for graph data structure.  
 (i) Graph (ii) Multigraph (iii) Complete graph. (06 Marks)
- b. Give the adjacency matrix and adjacency list representation for the weighted graph given in Fig.Q9(b). (06 Marks)

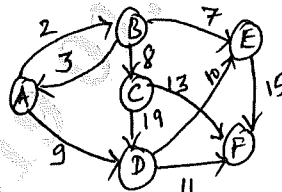


Fig.Q9(b)

- c. Write an algorithm for BFS and DFS graph traversal methods. (08 Marks)

**OR**

- 10 a. Apply insertion sort technique for the following elements : 77, 33, 44, 11, 88, 22, 66, 55. (08 Marks)
- b. Explain Hashing and collision. What are the methods used to resolve collision. (08 Marks)
- c. What are the basic operations that can be performed on a file? List the methods used for file organization (any 2). (04 Marks)

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