

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 "abxabcdabxabcdabcedabcy". (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)

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)
- Concatenation of two DLL.
 - 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.

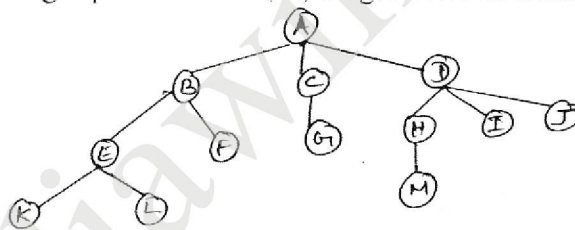


Fig.Q7(a)

(08 Marks)

- 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)

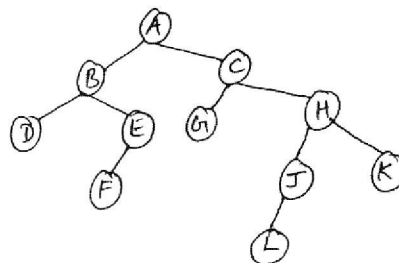


Fig.Q7(b)

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)

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)

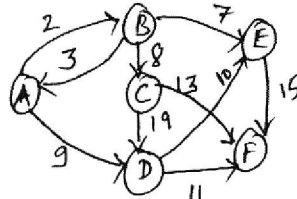


Fig.Q9(b)

- 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)