CBCS SCHEME

USN | | | | | | | | | | 18CS32

Third Semester B.E. Degree Examination, Jan./Feb. 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. Compare Structures and Unions.   (04 Marks)
   b. Define data structures. Give its classifications. What are the basic operations that can be performed on data structures?   (08 Marks)
   c. What is a Sparse matrix? Write the ADT of sparse matrix. Give the triplet form of a given matrix and also find its transpose.

$$A = \begin{bmatrix} 7 & 0 & 0 & 0 & 0 \\ 0 & 0 & 9 & 0 & 0 \\ 3 & 0 & 2 & 0 & 0 \\ 0 & 0 & 0 & 0 & 5 \end{bmatrix}$$

   Fig.Q1(c)   (08 Marks)

OR

2 a. Define polynomial? Explain with example how $A(x) = 3x^{23} + 3x^4 + 4x^2 + 15$ and $B(x) = x^5 + 20x^3 + 2$, are stored in a 1-D array?   (06 Marks)
   b. What are the structures used to store strings in memory? Explain with examples.   (06 Marks)
   c. Write a C program to demonstrate the basic operations on arrays.   (08 Marks)

Module-2

3 a. Define Stack. Write C functions for demonstrating various stack operations.   (08 Marks)
   b. Write an algorithm to evaluate postfix expression and trace the same on given expressions:
      i) $1\ 2\ 3 + * 3\ 2\ 1 - + *$
      ii) $6\ 2\ 3 + - 3\ 8\ 2 / + * 2\ \$\ 3 +$ (08 Marks)
   c. Write the postfix form of the following expression using stack:
      i) $(a + b) * d + e / (f + a * d) + c$
      ii) $((a / (b - c + d)) * (e - a) * c)$ (04 Marks)

OR

4 a. Define queue. Write QINSERT and QDELETE procedures for queues using arrays.   (10 Marks)
   b. What is Recursion? Write recursion procedure for (i) Finding GCD of two numbers. (ii) To find n Fibonacci numbers.   (10 Marks)

Module-3

5 a. What is a linked list? List and explain the different types of linked list with examples.   (08 Marks)
   b. Write the following algorithms for singly linked list:
      (i) Inserting ITEM as the first node in the list.
      (ii) Deleting the last node in the list.   (08 Marks)
   c. What is the advantage of doubly linked list over singly linked list? Illustrate with an example.   (04 Marks)

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OR

6 a. Write a node structure for linked representation of a polynomial. Explain the algorithm to add two polynomials represented using linked list.   **(08 Marks)**
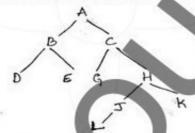   b. Write C functions insert_front( ) and delete_front( ) using doubly linked list.   **(08 Marks)**
   c. For the given Sparse matrix, give the linked list representation.

$$A = \begin{bmatrix} 0 & 0 & 4 & 0 & 0 \\ 6 & 5 & 0 & 0 & 0 \\ 0 & 3 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 2 \end{bmatrix}$$ **(04 Marks)**

Module-4

7 a. What is a tree? With suitable example, define
       (i) Binary tree   (ii) Complete binary tree   (iii) Strictly Binary tree   (iv) Skewed binary tree.
                                                                                    (10 Marks)
   b. Consider the following tree T in Fig.Q7(b). Write the preorder, inorder and postorder traversals for the tree T along with C functions. Also find the depth of tree T.

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

OR

8 a. Write the recursive search and iterative search algorithm for a binary search tree.   **(08 Marks)**
   b. For the given data, draw a binary search tree and show the array and linked representation of the same.
       100, 85, 45, 55, 110, 20, 70, 65   **(06 Marks)**
   c. What is the advantage of threaded binary tree over binary tree? Construct the threaded binary tree for 10, 20, 30, 40, 50.   **(06 Marks)**

Module-5

9 a. What is a graph? Give the difference between graph and tree. For the given graph [Fig.Q9(a)], show the adjacency matrix and adjacency list representation of the graph.
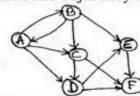

Fig.Q9(a)   **(08 Marks)**
   b. Write an algorithm for Breadth first search and depth first search.   **(08 Marks)**
   c. Define the following terms with examples:
       i) Multigraph   ii) Complete graph.   **(04 Marks)**

OR

10 a. What is hashing? Explain any 3 popular Hash functions.   **(08 Marks)**
    b. Write an algorithm for Radix sort.   **(06 Marks)**
    c. Summarize any 3 widely used file organization techniques.   **(06 Marks)**

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