## CBCS Scheme

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### Third Semester B.E. Degree Examination, June/July 2018
### Data Structures and Applications

Time: 3 hrs.                                                    Max. Marks: 80

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

### Module-1

1  a. Differentiate between structures and unions.                                    **(04 Marks)**
   b. Explain with example :   i) insertion and   ii) deletion in an array.           **(08 Marks)**
   c. Suppose each student in a class of 25 students is given 4 tests, assume the students are numbered from 1 to 25, and the test scores are assigned in the $25 \times 4$ matrix called SCORE. Suppose Base (SCORE) = 200, w = 4 and the programming language uses row–major order to store this 2D array, then find the address of $3^{rd}$ test of $12^{th}$ student i.e SCORE (12, 3).                                                                                      **(04 Marks)**

### OR

2  a. List and explain any 4 functions supported in C for dynamic memory allocation with examples.                                                                            **(08 Marks)**
   b. Consider 2 polynomials $A(x) = 2x^{1000} + 1$ and $B(x) = x^4 + 10x^3 + 3x^2 + 1$ with a diagram show how these polynomials are stored in 1D array.                         **(02 Marks)**
   c. With an example illustrate that "product of 2 sparse matrices may not be sparse". Also write a C function for matrix multiplication of 2 sparse matrices.                     **(06 Marks)**

### Module-2

3  a. Write an algorithm to evaluate a postfix expression. Evaluate the following postfix expression abc + *d e/- where a = 5, b = 6, c = 2, d = 12, e = 4.                     **(06 Marks)**
   b. Write the algorithm for Ackermann function. Evaluate A(1, 2) using ACKERMANN function.                                                                                    **(04 Marks)**
   c. With a neat diagram explain ONE–WAY list representation of a priority queue.     **(06 Marks)**

### OR

4  a. Write a C program demonstrating the various stack operations, including cases for overflow and underflow of STACKS.                                                          **(08 Marks)**
   b. Describe how you could model a maze, where 0 represents open paths and 1 represents barriers. What moves are permitted in the matrix model? Provide an example MAZE together with its allowable moves and table of moves.                                   **(08 Marks)**

### Module-3

5  a. Write a function for singly linked lists with integer data, to search an element in the list that is unsorted and a list that is sorted.                                          **(08 Marks)**
   b. Given 2 singly linked lists. LIST-1 and LIST-2. Write an algorithm to form a new list LIST-3 using concatenation of the lists LIST-1 and LIST-2.                             **(08 Marks)**

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**OR**

6  a.  Write a note on header linked list. Explain the widely used header lists with diagrams.
                                                                      **(05 Marks)**
   b.  List out any 2 differences between doubly linked lists and singly linked list.   **(02 Marks)**
   c.  Illustrate with examples how to insert a node at the beginning, INSERT a node at intermediate position, DELETE a node with a given value.   **(09 Marks)**

## Module-4

7  a.  Write a short note on threaded binary trees and state the rules to construct a threaded binary tree.   **(08 Marks)**
   b.  With separate functions illustrate recursive search and iterative search of a binary search tree.   **(08 Marks)**

**OR**

8  a.  Consider the following tree T in (Fig.8(a)) write the preorder, inorder, postorder for the tree T. Also find the depth of TREE in (Fig.Q8(a)).   **(04 Marks)**
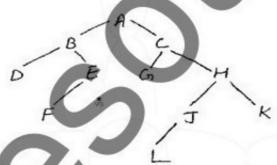


Fig.Q8(a)

   b.  Write functions to illustrate "copying of binary trees", and "testing equality of binary trees".   **(08 Marks)**
   c.  Define complete binary tree. Illustrate with examples.   **(04 Marks)**

## Module-5

9  a.  State and explain WARSHALLS algorithm with an example.   **(08 Marks)**
   b.  Write an algorithm for insertion sort. Apply insertion sort, showing the various passes to sort the array A, where A = [77, 33, 44, 11, 88, 22, 66, 55].   **(08 Marks)**

**OR**

10  a.  Write a short note on hashing. Explain any 3 popular HASH functions.   **(08 Marks)**
    b.  What do you understand by the term file organization? Briefly summarize any 3 widely used file organization techniques.   **(08 Marks)**

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