2024
B.A./B.Sc.
Second Semester
CORE – 3
COMPUTER SCIENCE
Course Code: CSC 2.11
(Data Structures)

Total Mark: 70 *Pass Mark: 28*
Time: 3 hours

Answer five *questions, taking* one *from each unit.*

UNIT–I

1. (a) Each element of an array DATA[20][50] requires 4 bytes of storage. The base address of data is 2000. Determine the location of DATA[10][10] when the array is stored as row major. 4
   (b) What is a sparse matrix? Explain the two methods of representing a sparse matrix. 1+4=5
   (c) Write a program to insert an element in an array. 5

2. (a) Write the syntax of a 3D array. 2
   (b) Write a program to count the number of words, consonants, vowels, special characters, and digits in a string. 6
   (c) Explain the various operations in data structure. 6

UNIT–II

3. (a) Given STACK with $N = 5$ memory cells 2
   STACK : A,_,_,_,_
   Describe the stack as the following operations take place:
   (i) POP(STACK, ITEM)
   (ii) PUSH(STACK, T)
   (iii) PUSH(STACK, K)
   (iv) POP(STACK, ITEM)
   (b) Write a program to reverse a string using stack. 6

(c) Convert the infix expression into prefix expression:
$a + b * (c / d) - e \wedge g * h + i$ 6

4. (a) Write the advantages of postfix expression over infix expression. 2
(b) Write the precedence of arithmetic operators. 3
(c) Write algorithm for evaluation of postfix expression. 4
(d) Convert infix expression into postfix expression: 5
$p - (q + r) * s \wedge t / g + (i - h) + j - k$

UNIT–III

5. (a) What is a self-organising list? 2
(b) Explain the four types of linked list. 4
(c) Write algorithm to insert an element in any position in the linked list. 8

6. (a) Write down any three advantages and any three disadvantages of linked list. 3+3=6
(b) Write algorithm to delete an element in any position in the linked list. 8

UNIT–IV

7. (a) Define the following terms in binary tree: 1×5=5
(i) Degree of a node
(ii) Leaf
(iii) Height of a node
(iv) Depth of a node
(v) Siblings
(b) (i) Construct a binary search tree by inserting the following elements: 3

50	12	78	90	34	67	2	88	4	100

(ii) Traverse the above binary search tree using the pre-order and post-order traversal methods. 3+3=6

8. (a) What are the methods to delete a node having two child nodes from a binary search tree? 2

(b) Construct an AVL tree by inserting the following elements: 6

5	3	4	10	7	11

(c) Explain the two ways to create a one way threaded binary tree. 6

UNIT–V

9. (a) Write function definition for binary search method. 4
   (b) Write function definition for selection sort method. 5
   (c) Sort the following elements in an array in ascending order using insertion sort: 5

23	8	12	1	7	6	10

10. (a) Sort the following elements in an array in ascending order using bubble sort: 4

2	9	3	4	1

   (b) Write function definition for selection sort method. 4
   (c) Write function definition for shell sort method. 6