SEM–3013

M.Sc. (IIIrd Semester) Examination, 2022
COMPUTER SCIENCE

Paper – MCS–301

(Data Structure)

Time : 3 Hours]   [*Maximum Marks : 40*

Section–A   **(Marks : 1 × 10 = 10)**

Note :–   Answer all *ten* questions (Answer limit **50** words). Each question carries **1** mark.

Section–B   **(Marks : 3 × 5 = 15)**

Note :–   Answer any *five* questions by selecting at least *one* question from each Unit (Answer limit **200** words). Each question carries **3** marks.

Section–C   **(Marks : 5 × 3 = 15)**

Note :–   Answer any *three* questions by selecting *one* question from each Unit (Answer limit **500** words). Each question carries **5** marks.

Section–A

1.   (i)   What is a linear data structure ? Name some example of linear data structure.

      (ii)   Are linked lists considered linear or non-linear data structure or both ? Justify your answer.

(iii) Why do we need to do an Algorithm Analysis ?

(iv) What is a postfix expression ? Convert given expression into postfix expression :

$$(A + B) * (C - D)$$

(v) Define the Binary Search Tree (BST).

(vi) Why a Binary Search Tree (BST) is converting into AVL Tree ? Give justification.

(vii) What are the applications of graph data structure ?

(viii) What do you mean by degree of node ? Explain.

(ix) What are asymptotic notations ?

(x) How can we represent a polynomial expression "$4x^3y^3 + 5x^2y + 4xy + 5$" by linked list data structure ?

Section–B

Unit–I

2. Define time and space complexity of an algorithm. What is time complexity for binary search algorithm.

3. What is Stack ? Explain the PUSH and POP operation of algorithm on stack.

4. What are the differences between Linear and Circular linked list ?

Unit–II

5. Convert the following infix expressions into postfix expressions :

(a) (a + b * (c + d))

(b) a * b * c + d * f

(c) (a + b) + (b * d + c) * (a + b)

6. Write an algorithm to insert a node in doubly link list at a specified position.

7. Explain the linked list representation queue.

Unit–III

8. Explain and write algorithm for post-order tree traversal method.

9. Construct binary tree if pre-order traversal sequence is ABFCD and inorder traversal sequence is FBADC.

10. Write application of Binary Tree.

Section–C

Unit–I

11. Write an algorithm to sort an array by using selection sort method. Analyse the time complexity of algorithm.

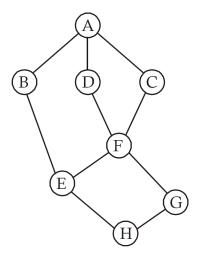12. Write advantages and disadvantages of two-way linked list over singly linked list.

Unit–II

13. Explain different operations like insertion and deletion over circular linked list.

14. Explain at least *five* applications of stack with suitable examples.

Unit–III

15. Construct an AVL tree for given sequence of Data step by step diagram :

    25, 37, 50, 70, 80, 65, 55

16. Traverse the given graph by using depth first traversal algorithm :