23124

3 Hours / 70 Marks　　Seat No. ☐☐☐☐☐☐☐☐

Instructions :　(1)　All Questions are *compulsory*.

(2)　Answer each next main Question on a new page.

(3)　Illustrate your answers with neat sketches wherever necessary.

(4)　Figures to the right indicate full marks.

(5)　Assume suitable data, if necessary.

(6)　Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. **Attempt any FIVE of the following :**　　**10**

(a)　State any two differences between linear search and binary search.

(b)　Define term pointer and null pointer.

(c)　Define the terms : linear data structure and non-linear data structure.

(d)　List any four applications of queue.

(e)　Write any four operations that can be performed on data structure.

(f)　Convert the following infix expression to its postfix form using stack :

A + B – C * D/E + F

(g)　Describe given two types of graphs : Directed graph and Undirected graph.

2. **Attempt any THREE of the following :**　　**12**

(a)　Describe working of selection sort method with suitable example.

(b)　Write algorithm to delete an intermediate node from a singly linked list.

(c)　Differentiate between tree and graph w.r.t. any four parameters.

(d)　Convert the given infix expression to postfix expression using stack and the details of stack at each step of conversion.

Expression : A * B ↑ C – D / E + [F / G]

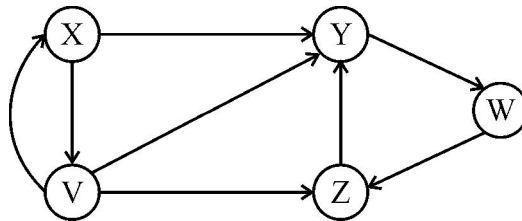3. **Attempt any THREE of the following :** 12

   (a) Explain complexity of following algorithms in terms of time and space :

   (i) Binary search

   (ii) Bubble sort

   (b) Draw an expression tree for the following expression :

   $(a + 3b - 7c)^3 * (6d - 8e)^7$

   (c) Describe working of bubble sort with example.

   (d) Show the effect of PUSH and POP operation on the stack of size 10. The stack contains 10, 20, 25, 15, 30 & 40 with 40 being at top of stack. Show diagrammatically the effect of

   (i) PUSH (45)   (ii) PUSH (50)

   (iii) POP   (iv) PUSH (55)

4. **Attempt any THREE of the following :** 12

   (a) Create singly linked list using data fields 10, 20, 30, 40, 50 and show step-by-step procedure with the help of diagram from start to end.

   (b) Describe advantages of circular link list over linear link list with example.

   (c) Explain the working of Radix sort method with an example.

   (d) Write an algorithm to count no. of nodes in singly linked list.

   (e) Consider the graph 'G' in the following figure :

   (i) Find all simple path from X & Z.

   (ii) Find indegree and outdegree of node Y and Z.

   (iii) Find adjacency matrix A for the above graph.

   (iv) Give adjacency list representation of above graph.

5. **Attempt any TWO of the following :** 12

   (a) Define the term tree traversal. Construct the Binary Search Tree (BST) of following :

   85, 90, 45, 60, 25, 35, 10, 20, 75, 95 and traverse the above BST in inorder, preorder & postorder.

   (b) Explain operation on singly linked list.

   (c) Implement a 'C' program to insert element into the queue and delete the element from the queue.

6. **Attempt any TWO of the following :** 12

   (a) Find out prefix equivalent of the expression :

   (i) [(A + B) + C] * D

   (ii) A[(B * C) + D]

   (b) Sort the following number in ascending order using bubble sort. Given numbers as follows : 475, 15, 513, 6753, 45, 118.

   (c) Describe circular linked list with suitable diagram. State advantages of circular linked list over linear linked list.

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