Instructions: (1) All Questions are Compulsory.
(2) Illustrate your answers with neat sketches wherever necessary.
(3) Figures to the right indicate full marks.
(4) Assume suitable data, if necessary.
(5) Preferably, write the answers in sequential order.

1. Attempt any FIVE of the following: [10]
   (a) List any four operations on data structure.
   (b) Explain the concept of information, Next, Null pointer and empty list with respect to link list.
   (c) List any four applications of queue.
   (d) Differentiate between stack and queue (Any 2 points).
   (e) Define the terms: Linear data structure and non-linear data structure.
   (f) Explain time complexity and space complexity.
   (g) Write any four applications of data structure.

2. Attempt any THREE of the following: [12]
   (a) Explain the working of Binary search with an example.
   (b) Explain stack overflow and underflow conditions with example.
   (c) Describe the concept of linked list with the terminologies: node, next pointer, null pointer and empty list.
   (d) Write an algorithm to insert a node in between in a link list.

3. Attempt any Three of the following: [12]
   (a) Write an algorithm for inorder traversal of binary tree.
   (b) For the following directed graph:
      (i) Give adjacency matrix representation.
      (ii) Give adjacency list representation.
   (c) Evaluate the following postfix expression:
      \[ 5, 6, 2, +, *, 12, 4, /, - \] - Show diagrammatically each step of evolution using stack.
   (d) Write 'c' program for deletion of an element from an array.
4. Attempt any THREE of the following: [12]
   (a) Construct a binary search tree for following elements:
       30, 100, 90, 15, 2, 25, 36, 72, 78, 10 show each step of construction of BST.
   (b) Explain the concept of double ended queue.
   (c) Draw the tree structure of the following expressions:
       (i) \((2a + 5b)^3 \times (x - 7y)^4\)  
       (ii) \((a - 3b) \times (2x - 7)^3\)
   (d) Write an algorithm to delete a node from the beginning of a circular linked list.
   (e) Describe circular linked list with suitable diagram. Also state advantage of circular linked list over linear linked list.

5. Attempt any TWO of the following: [12]
   (a) For given binary tree write in-order, pre-order and post-order traversal.

   ```
   A
   / \   /
  B   C D
 / \   /  
D F   I   
/  \    /   
E H J K   
```

   (b) Write an algorithm to count numbers of nodes in singly linked list.
   (c) Consider the graph given in Figure. Find its adjacency matrix and adjacency link representation.

   ```
   A B C
   / \ /  
D E F   
/ \ /  
G H  I   
```

6. Attempt any TWO of the following: [12]
   (a) Create a Singly Linked List using data fields 10, 20, 30, 40, 50. Search a node 40 from the SLL and show procedure step-by-step with the help of diagram from start to end.
   (b) Describe breadth first search traversal in a graph with example.
   (c) Create a singly linked list using data fields 90, 25, 46, 39, 56. Search a node 40 from a SLL and show procedure step-by-step with the help of diagram from start to end.
## S.Y. Diploma Sem-III: Paper Discussion Schedule

<table>
<thead>
<tr>
<th>Branches</th>
<th>Date</th>
<th>Day</th>
<th>Timing</th>
<th>Centres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Group</td>
<td>6 Nov. 2019</td>
<td>Wednesday</td>
<td>8 a.m. to 9 a.m.</td>
<td>Dadar</td>
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<tr>
<td></td>
<td>6 Nov. 2019</td>
<td>Wednesday</td>
<td>10 a.m. to 11 a.m.</td>
<td>Thane</td>
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