Question 1

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| a | Distinguish between sorted list and ordered list. | 5 |
| b | Suppose there is a situation where the number of data is known at compile time. Still someone chose to store the data in a linked list instead of static array. Analyze the situation and tell what will be the possible problems regarding performance considering locality of reference. | 10 |
| c | Someone has wrote the following code to delete a node of a single linked list by value. However, the program is sometimes crashing when the function is being called.   |  | | --- | | void deleteByValue(int n)  {  Node \*temp=head;  while(temp!=NULL)  {  if(temp->next->value==n)  {  Node \*ptr=temp->next;  temp->next=ptr->next;  delete ptr;  }  else temp=temp->next;  }  } |   Inspect the code written above and tell-   1. Which line might be causing the crash. 2. Write the corrected version of the function. | 15 |

Question 2

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| a | Explain what an abstract data structure is. How is it different from raw data structures? Give example. | 5 |
| b | How is a Ring Buffer (Circular Queue) different from a regular Queue? How can we implement a circular queue using a single linked list? Draw necessary diagrams showing the head pointer and prev and next pointer for each nodes and tell how the enqueue and dequeue operation will take place. | 10 |
| c | Implement a single linked list with push\_front() and pop\_front() operation. Design a Stack class using only your implemented single Linked list having push() and pop() function. Write the C++ code. | 15 |

Question 3

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| a | Distinguish between linear and non-linear data structures. Which data structure will be suitable for storing hierarchical data such as File directory? Explain. | 10 |
| b | Construct the binary tree from the following in-order and pre-order traversal.   |  |  | | --- | --- | | In-order Traversal | 4, 6, 5, 7, 2, 1, 8, 3, 9, 10 | | Pre-order Traversal | 1, 2, 4, 5, 6, 7, 3, 8, 9, 10 | |  |  | | 10 |
| c | A tree having n nodes will have exactly (n-1) edges. Prove that introducing another edge (so that the number of edges is now n) will cause it to have a cycle. | 10 |

Question 4

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| a | Define Ordered Tree and explain it by drawing pictorial example. Is binary tree an ordered tree? | 10 |
| b | Explain the difference between a subgraph and spanning subgraph. How are they different from Spanning tree? | 10 |
| c | Prove that, for an undirected graph, the total number of degree of vertices is equal to twice the number of edges. | 10 |