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| **SESSION** | **FEB-MARCH 2025**  |
| **PROGRAM** | **MASTER OF COMPUTER APPLICATIONS (MCA)** |
| **SEMESTER** | **II** |
| **COURSE CODE & NAME** | **DCA 6209 DATA STRUCTURES AND ALGORITHMS** |
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**Set-I**

**Q1. What do you understand by Algorithm Complexity? Discuss Time and Space Complexity in detail by taking suitable examples 5+5**

**Ans 1.**

**Algorithm Complexity**

Algorithm complexity refers to the analysis of the efficiency of an algorithm in terms of the resources it consumes. It helps evaluate how the algorithm's performance changes with the size of the input. The two main measures of algorithm complexity are time complexity and space complexity. These metrics allow programmers to compare different algorithms and choose the

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**Q2. What is the linked list? Explain the types of linked lists with examples 5+5**

**Ans 2.**

**Linked List**

A linked list is a linear data structure where each element (called a node) contains two parts: data and a pointer to the next node. Unlike arrays, linked lists do not store elements in contiguous memory locations, allowing dynamic memory allocation and efficient insertions or deletions.

**Singly Linked List**

In a singly linked list, each node points only to the next node in the sequence. It begins with a

**Q3. Explain the working of a Queue data structure. What are its applications in real-world scenarios? 5+5**

**Ans 3.**

**Queue Data Structure**

A queue is a linear data structure that follows the First-In-First-Out (FIFO) principle. This means the element inserted first is removed first. In a queue, elements are added at the rear and removed from the front. It is widely used in situations where order of processing must be preserved.

**Basic Operations of a Queue**

**Set-II**

**Q4. Discuss Graph Data Structure and its representations in detail. 10**

**Ans 4.**

**Graph Data Structure**

A graph is a non-linear data structure consisting of a finite set of nodes (also called vertices) and a set of edges that connect pairs of nodes. Graphs are used to represent networks such as social media connections, roads, communication networks, and many real-world relationships where entities are interconnected.

**Types of Graphs**

Graphs can be directed or undirected. In a directed graph, edges have a direction, meaning they

**Q5. Discuss the role of hashing in file structures. Explain collision resolution methods.5+5**

**Ans 5.**

**Hashing in File Structures**

Hashing is a technique used to map large datasets to fixed-size structures, typically for efficient searching, insertion, and deletion operations. In file structures, hashing is primarily used to store and access data quickly using a hash function that computes the storage location (or address) based on the key.

A hash function converts a key (like a name or ID) into an index in a hash table. This allows

**Q6. Explain the different methods of External Sorting and why it is used in Large Datasets? Discuss 10**

**Ans 6.**

**External Sorting**

External sorting refers to sorting algorithms that are designed to handle massive datasets that cannot fit entirely in the main memory (RAM). These datasets are stored on secondary storage devices such as hard disks or SSDs. Since disk access is much slower than memory access, external sorting algorithms are optimized to minimize disk I/O operations while handling large