Assignment: University Library Management System Using Linked List, Sorting, and Searching

Scenario:

A **university library** maintains records of books using a **linked list**. Each book record contains the following details:

- **Book ID** (Unique integer identifier)

- **Title** (String, up to 50 characters)

- **Author** (String, up to 30 characters)

- **Publication Year** (Integer)

- **Availability** (1 if available, 0 if checked out)

The library needs an efficient system to **add, search, and sort** book records dynamically. Since books are frequently borrowed and returned, a **linked list** is chosen for dynamic memory management. Your task is to develop a system with the following functionalities:

Problem Statement:

You need to implement a **Library Management System** using a **linked list** with the following features:

1. **Insert a New Book Record:**

   - Allows adding a new book to the list.

   - The book should be inserted in **sorted order based on Book ID** (ascending).

2. **Search for a Book:**

   - Given a **Book ID**, find the book details and display them.

   - If the book is not found, display an appropriate message.

   - Use **Binary Search** technique to searching operation.

3. **Sort Books by Publication Year:**

   - Implement **Merge Sort** to sort books based on their **Publication Year** (oldest to newest).

- Display the sorted book list.

4. **Check Book Availability:**

- Given a **Book ID**, check whether the book is **available or checked out**.

Input Constraints:

- **1 ≤ Book ID ≤ 10^6**
- Publication Year: **1900 ≤ Year ≤ 2025**
- Book Title: **Up to 50 characters**
- Author Name: **Up to 30 characters**

Example Input & Output:

Input 1: Adding and Searching a Book

Enter number of books: 3

101 "C Programming" "Dennis Ritchie" 1978

105 "Data Structures" "Mark Weiss" 2002

110 "Artificial Intelligence" "Stuart Russell" 2010

Enter Book ID to search: 105

Output:

Book Found:

Book ID: 105

Title: Data Structures

Author: Mark Weiss

Publication Year: 2002

Availability: Available

Input 2: Sorting by Publication Year

Sorting books by Publication Year

Output:

101 "C Programming" "Dennis Ritchie" 1978

105 "Data Structures" "Mark Weiss" 2002

110 "Artificial Intelligence" "Stuart Russell" 2010

Input 3: Checking Book Availability

Enter Book ID to check availability: 110

Output:

Book ID: 110 is Available.