**National University of Computer and Emerging Sciences**



**Lab Manual 5**

***for***

**Object Oriented Programming (OOP)**

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**Lab Manual 5**  
  
 You are tasked with developing a C++ application for managing a library's book collection. Each book contains the title, author, and a list of reviews. The reviews are stored as a dynamically allocated array, and there can be a variable number of reviews for each book.

**Requirements:**

1. **Class Creation:**
   * Define a Book class with the following private data members:
     + A string for the title of the book.
     + A string for the author's name.
     + A dynamically allocated array of review scores (doubles).
     + An integer to track the number of reviews.
2. **Constructors and Destructors:**
   * Implement the following constructors:
     + A default constructor that initializes the title, author, and review array with default values (e.g., title to an empty string, author to an empty string, and review array to nullptr).
     + A parameterized constructor that initializes the title, author, and allocates memory for the reviews based on the number of reviews provided.
     + A copy constructor that performs a **deep copy** of the book object.
     + Another copy constructor that performs shallow copy of the book object.
     + A destructor that frees the dynamically allocated memory.
3. **Constant Member Functions:**
   * Implement constant member functions to:
     + Retrieve the book's title and author.
     + Display all the details of the book, including the title, author, and the list of reviews.
4. **Private Functions:**
   * Implement private member functions to:
     + Calculate the average review score.
     + Return the total number of reviews of a book.
5. **Public Functions:**
   * Implement function to add new reviews to a book.
6. **Tasks:**
   * **Class Definition**: Write the Book class with all required features and functions.
   * **Object Creation**: In the main() function, create several Book objects using different constructors, including testing the copy constructors for deep copy and shallow copy.
   * **Pointer Usage**: Create a pointer to the book object and call all functions through the pointer.
   * **Shallow Copy Demonstration**: Show the problem that arises with shallow copying by copying an object. (Write briefly the problem in comments in your code).
   * **Display Information**: Use constant member functions to output the book's details in a formatted manner.