MARK MWANAVINA – BIT/21/SS/026 MID-SEM EXAMS

Problem 1: A digital library

**b.** The digital library system exhibits various object relationships, including inheritance, association, aggregation, and composition. Inheritance is demonstrated by the **Book** class serving as a parent to **HardCopyBook** and **SoftCopyBook**, reflecting an "is-a" relationship. Association exists between the **Book**, **Author**, and **Publisher** classes, representing "has-a" relationships where a book is linked to both an author and a publisher through object references. Aggregation is seen in the **DigitalLibrary** class, which manages multiple books but does not create them, maintaining a "has-many" relationship. Although not explicitly implemented, composition would occur if an object fully controlled another’s lifecycle.

**c.** Abstraction is applied through abstract classes, abstract methods, information hiding, and behavioral abstraction. The **Book** class is declared abstract, ensuring all book types share a common structure, and **SoftCopyBook** is also abstract, defining behaviors for digital books. Abstract methods like **getFormat()** enforce implementation in subclasses while maintaining flexibility. Information hiding is achieved by declaring class fields private and providing access through getters and setters, ensuring controlled data manipulation. Behavioral abstraction is evident in different book types implementing unique functionalities, while the **DigitalLibrary** class simplifies book management through methods like **addBook()**, **removeBook()**, and **findBook()**, allowing users to interact without needing internal details.