Q.NO. 1

a. What is a requirement engineering? Explain your answer.

Ans:- A requirement is a documented statement of a need, constraint, or condition that must be satisfied by a system, product, or project. Requirements serve as a bridge between the stakeholders' expectations and the design and development process. They define what a system or project is supposed to accomplish, how it should behave, and what its constraints and quality attributes are. Requirements can encompass various aspects, including functionality, performance, usability, security, and more.

b. List THREE (3) methods of gathering requirements.

Ans:-Gathering requirements in a project is a crucial phase in requirement engineering, as it lays the foundation for the entire project.

Here are some methods and techniques for gathering requirements:

  i. Stakeholder Interviews: Conduct one-on-one or group interviews with stakeholders, including end-users, clients, subject matter experts, and project managers. These interviews help in understanding their needs, expectations, and concerns.

  ii. Surveys and Questionnaires: Distribute surveys and questionnaires to a larger group of stakeholders to collect structured feedback and data about their requirements.

  iii. Workshops and Focus Groups: Organize workshops or focus groups with relevant stakeholders to facilitate discussions, brainstorming, and idea generation regarding project requirements.

  iv. Document Analysis: Review existing documentation, such as business documents, user manuals, and system specifications, to extract valuable requirements information.

  v. Observation: Observe users and system interactions in their natural environment to gain insights into their workflow and needs.

 vi. Prototyping: Create low-fidelity or high-fidelity prototypes to visually demonstrate system functionality and gather feedback from stakeholders.

C. With suitable examples, explain TWO (2) Functional Requirements and TWO (2) Non-Functional Requirements.

Ans:-

Functional Requirements (FRs)

   1. User Authentication (FR):- The system must provide a secure login mechanism that requires users to enter a valid username and password to access their accounts.

   2. Inventory Management (FR):- The system must allow users to add, edit, and delete items in an online store's inventory. Users should also be able to view product details, such as price and availability.

   Non-Functional Requirements (NFRs)

   1. Performance (NFR):- The system must be able to handle a minimum of 100 concurrent users during peak hours without experiencing performance degradation. Response times for user actions should be less than 2 seconds.

   2. Security (NFR):- The system must implement encryption for user data during transmission and storage. It should also enforce role-based access control to restrict unauthorized access to sensitive information.

d. Describe feasibility study in requirement engineering.

Ans:- A feasibility study is a crucial step in requirement engineering that assesses the viability and practicality of a proposed project or system. It aims to determine whether the project can be completed successfully within constraints such as time, budget, and available resources. The main objectives of a feasibility study are to evaluate technical, operational, economic, and scheduling aspects. It helps stakeholders make informed decisions about whether to proceed with a project or not.

e. What is risk analysis in requirement engineering? Give TWO (2) examples of risk factors.

Ans:- Risk analysis is the process of identifying, assessing, and prioritizing potential risks or uncertainties that could affect the success of a project or the performance of a system. It involves analyzing the likelihood and impact of various risks and developing strategies to mitigate or manage them.

Here are two examples of risk factors:-

  1. Technical Risk:- This type of risk involves uncertainties related to technology and development processes. For example, a technical risk in software development could be the uncertainty surrounding the compatibility of a new software module with existing infrastructure.

  2. Market Risk:- Market risks pertain to uncertainties in the market conditions, such as changing customer preferences or economic fluctuations. For instance, a market risk for a retail business might be a sudden drop in consumer demand due to a recession.

Q.NO. 2

a. Describe the process of server delivering services to clients in client-server architecture.

Ans:- In client-server architecture, the process of delivering services to clients involves the following steps:

   1. Client sends a request:- The client initiates communication by sending a request to the server. This request typically specifies the service or data it needs.

   2. Server processes the request:- The server receives the request and processes it according to the requested service. This may involve accessing databases, performing calculations, or executing specific functions.

   3. Server sends a response:- Once the server has processed the request, it sends a response back to the client. The response contains the requested data or the result of the requested service.

   4. Client receives and handles the response:- The client receives the response and processes it, which may involve displaying data to the user or taking further actions based on the response.

b. Explain THREE (3) benefits of Unified Modeling Language (UML) in modeling.

Ans:- Three benefits of Unified Modeling Language (UML) modeling are:

   1. Communication:- UML provides a common visual language that allows stakeholders, including developers, designers, and non-technical team members, to communicate and understand the system's structure and behavior more effectively. This reduces ambiguity and ensures everyone is on the same page.

   2. Visualization:- UML diagrams offer a visual representation of a system's architecture, components, and interactions. This visual representation makes it easier to grasp complex systems, identify potential design flaws, and make informed decisions about system design and modifications.

   3. Design and Analysis: UML modeling facilitates the design and analysis of software systems before actual implementation. It helps in identifying potential issues, refining system architecture, and making design decisions early in the development process, reducing the cost and effort required to rectify issues later.

## C. Draw a collaboration diagram for the following scenario:

System ABC prompts the username and password when the user clicks on a login button to check that the user has authorization and logs the user in. If there is a problem with the name or password, the user is given one more chance to enter a valid name and password, otherwise the login program goes into a 5-minute time-out, then returns to idle mode. While the user is logged in, the user is allowed to execute different applications by clicking on appropriate buttons. The session terminates when the user clicks the log out button.
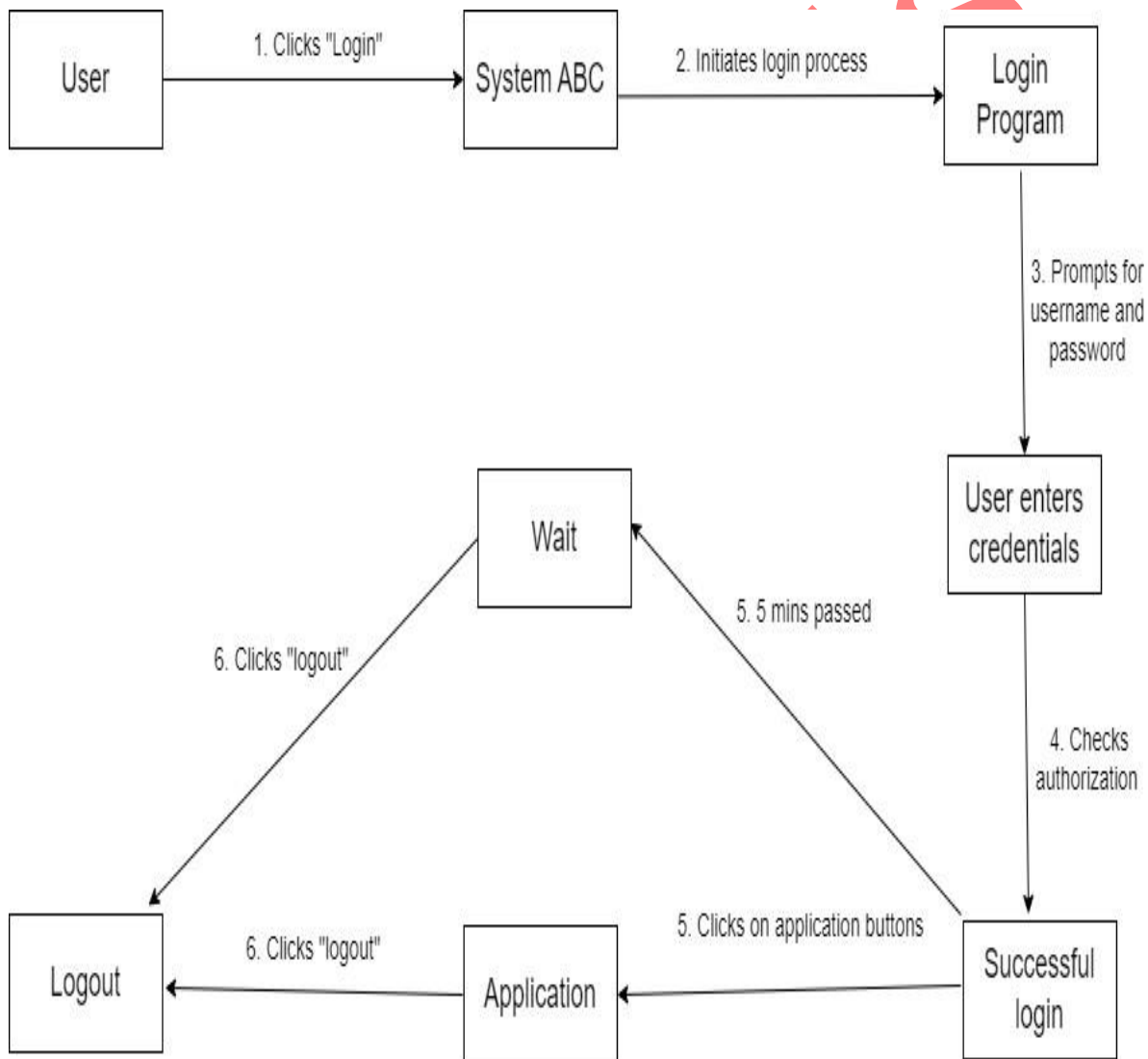
Q.NO. 3

To take an exam, an instructor first notifies the students of the exam date and the material to be covered. She then prepares the exam paper (with sample solutions), gets it copied to produce enough copies for the class, and hands it out to students at the designated time and location. The students write their answers to exam questions and hand in their papers to the instructor. The instructor then gives the exam papers to the TAs, along with sample solutions to each question, and gets them to mark it. She then records all marks and returns the papers to the students.

**a. Draw a sequence diagram representing this process**
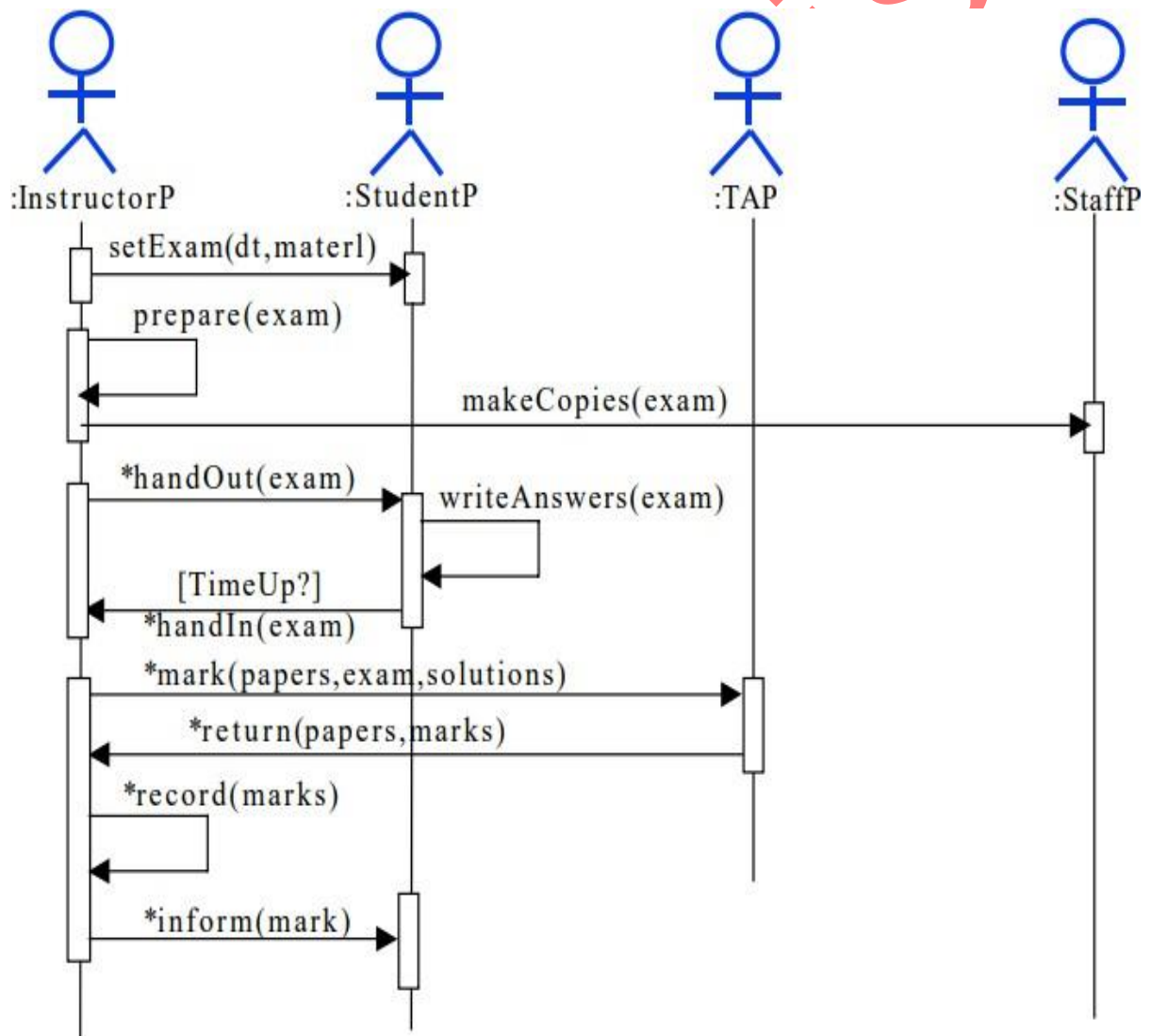
b. Draw a use case diagram for the above scenario.
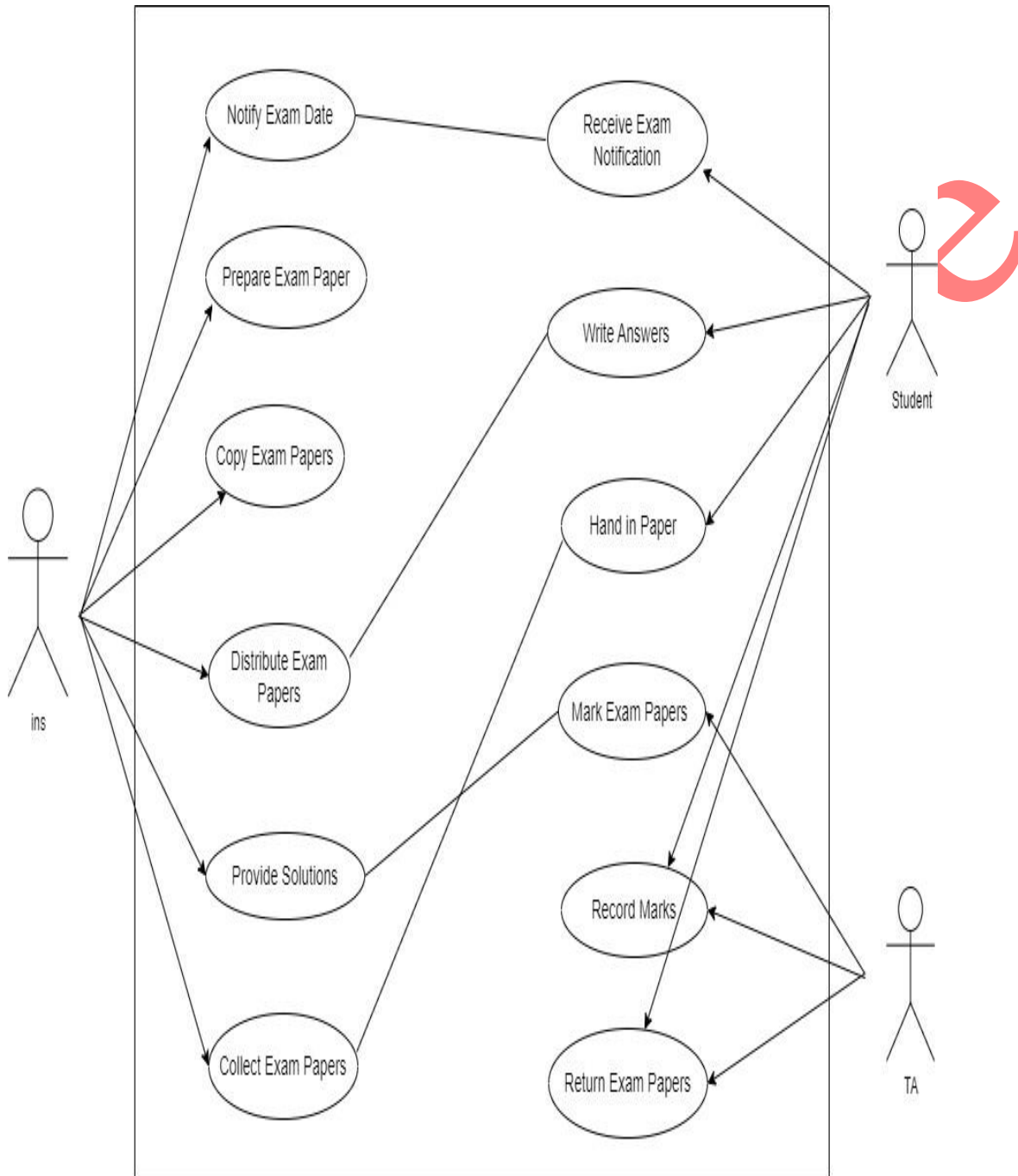
c. Draw a state machine diagram to show the following processes:

- To pass the course, the student must attend two lectures, present to the class a paper she read, and complete a course project, due on the last day of the term.
- To give a presentation, the student is given a date by the instructor, prepares the presentation, and gives it on the assigned day. At any time, the student can drop the course.
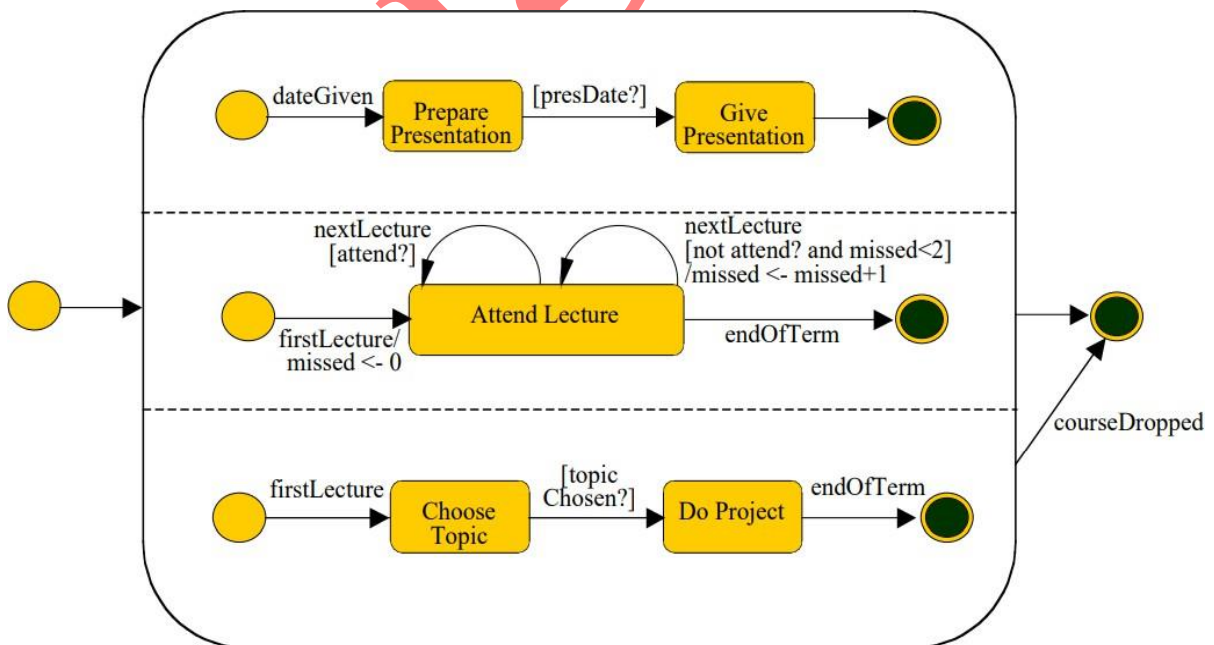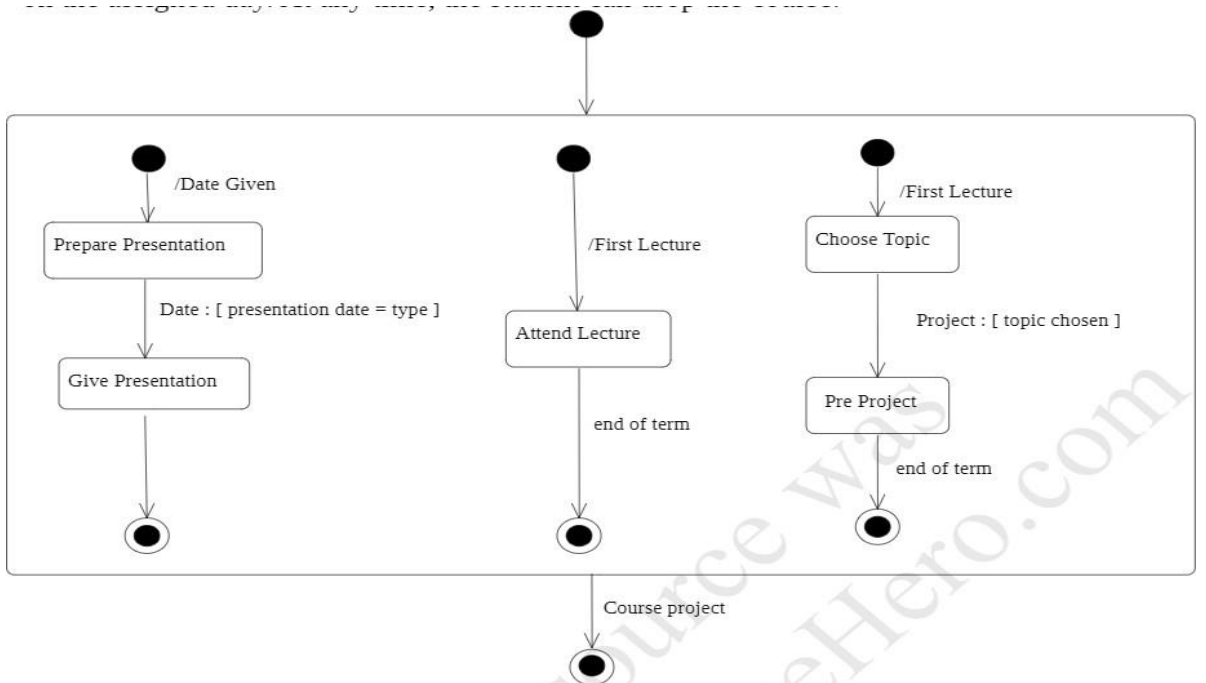
Q.NO. 4

Consider the world of libraries. A library has books, videos, and CDs that it loans to its users. All library material has an id# and a title. In addition, books have one or more authors, videos have one producer and one or more actors, while CDs have one or more entertainers. The library maintains one or more copies of each library item (book, video, or CD). Copies of all library material can be loaned to users. Reference-only material is loaned for 2 hours and can't be removed from the library. Other material can be loaned for 2 weeks. For every loan, the library records the user, the loan date and time, and the return date and time, For users, the library maintains their name, address, and phone number.

a. Draw a class diagram for the description above. Make sure to show attributes, multiplicities and aggregations or compositions where appropriate.
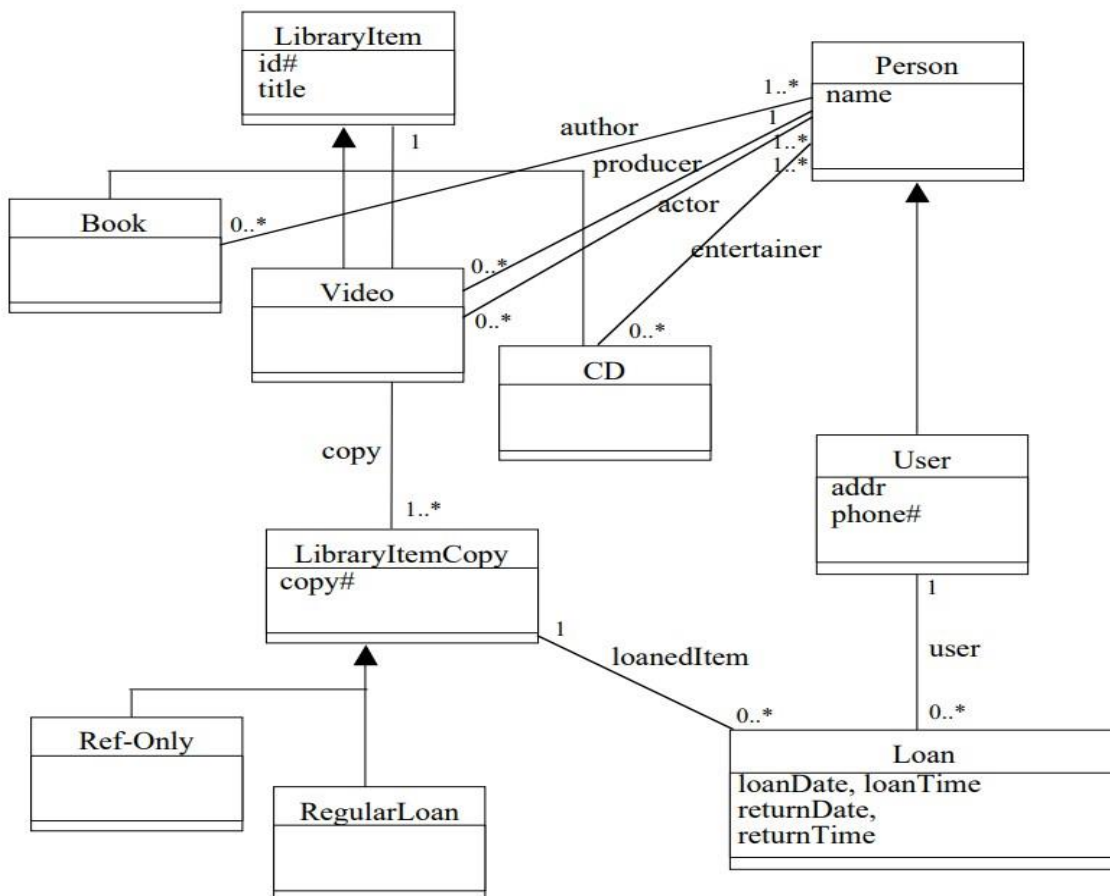
Ans:-

b. Identify FIVE (5) functional requirements from the above case study.

Ans:- Here are five functional requirements based on the provided case study for a library system:

1. Material Inventory Management:- The system should be able to maintain a catalog of all library materials, including books, videos, and CDs, with a unique ID and title for each item.

2. User Management:- The system should provide functionality to manage user information, including their name, address, and phone number.

3. Loan Management:- The system should facilitate the process of loaning library materials to users, including reference-only materials for 2 hours and other materials for 2 weeks. It should record the user, loan date and time, and the return date and time for each loan transaction.

4. Material Type Specifics:- The system should capture and differentiate between the specific attributes of different types of materials (e.g., authors for books, producer and actors for videos, entertainers for CDs).

5. Copy Management:- The system should keep track of multiple copies of each library item, allowing for the loan and return of individual copies while ensuring that reference-only materials cannot be taken outside the library.