SEPM
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6CSE-F

Assignment - 2

1] Explain software Requirement Analysis & specification in detail

→ Software Requirement Analysis & Specification is a crucial phase in the SDLC where the functional and non-functional requirements of the system are gathered, analyzed, and documented.

1. Software Requirment analysis

→ Software Requirement analysis is the process of collecting, understanding, and refining user needs into well-defined software requirements. It ensures that the final software meets the expectations of users and stakeholders.

- Types of Requirements

1. Functional Requirements: Define the core functionalities of the software.
2. Non-Functional Requirements: Define quality attributes like performance, security, and usability.
3. Domain Requirements: Specific needs related to the industry or organization.

2. Software Requirement specification (SRS)

⇒ SRS is a formal document that details the software requirements in a structured manner. It acts as a contract between developers and stakeholders ensuring clarity and mutual understanding

• characteristics of good SRS

⇒ Correct :- Accurately defines all system requirements
⇒ Unambiguous :- Clearly written with no vague terms
⇒ Complete :- Covers all functional and non-functional requirements.
⇒ Consistent :- No contradictions between different requirements
⇒ Verifiable :- Each requirement can be tested.
⇒ Modifiable :- Easy to update when requirements change.

⇒ SRS provides a reference for software developers and testers. It helps in estimating costs and project timelines

⇒ SRS Acts a foundation for system design and architecture. Ensures all stakeholders expectations are documented and met.

2] Explain Requirement Analysis and Requirement engineering tasks

1. Requirement Analysis

→ Requirement Analysis is the process of gathering, understanding, analyzing, and refining the needs of users and stakeholders to define the functionalities and constraints of a software system.

→ It ensures that the final product meets the expectations and business objectives.

2. Requirement Engineering tasks

→ Requirements Engineering is a systematic approach to eliciting, documenting, analyzing, verifying and managing software requirements throughout the software development life cycle.

1. Requirement Elicitation

→ Gathering requirements from stakeholders using methods such as:

- Interviews, surveys, Questionnaires
- Prototyping
- Brainstorming
- Observation.

2. Requirement specification

→ Documenting the gathered requirements in an organized manner in the SRS document

→ SRS includes functional requirements, non-functional requirements and constraints and assumptions.

3. Requirement Analysis & Negotiations

→ Analyzing requirements for completeness, correctness, consistency, and feasibility.

→ Resolving conflicts between different stakeholders

4. Requirement validation

→ Ensuring that the requirements accurately describe the system to be developed.

→ Method used for validation :-
Reviews and Inspections, Prototyping, Test case generation

5) Requirement Management

→ Handling changes in requirements during software development. Maintaing a version control system for req. changes

3] Define design concepts: abstraction, modularity, information hiding, functional independent cohesion and coupling.

i Abstraction

→ Abstraction is the process of hiding complex implementation details and exposing only the essential features of a system.

ii Modularity

→ Modularity refers to dividing a software system into smaller, manageable, and independent units called modules.

iii Information hiding

→ Information hiding is the principle of restricting access to certain parts of a module and exposing only what is necessary..

iv Functional Independence

→ Functional independence ensures that each module performs a single function with minimal dependency on other modules.

v Cohesion

→ Cohesion refers to the degree to which the elements of a module work together to achieve a single purpose.

vi coupling

→ Coupling is the degree of dependency between different modules in a software system.

4. Explain types of testing in brief

→ Software testing is the process of evaluating a software application to ensure it meets the specified requirements and is free from defects.

i Functional Testing

→ Functional testing verifies that the software functions correctly according to the given requirements.

- Unit testing: Tests individual components or modules.
- Integration Testing: Tests the interaction between different modules.
- System Testing: Tests the complete application as whole

ii Non-Functional testing

→ Non-functional testing evaluates the performance, security, usability, and reliability of the application.

- Performance testing: checks how the system performs under different conditions.

- Load testing :- Measures system behavior under expected user load
- Stress testing :- Tests the system under extreme conditions to identify its breaking point.
- Security testing :- Ensures data protection and prevents unauthorized access.

iii) White - Box

⇒ White-box testing is a code-based testing is code-based testing method where the internal structure, logic, and code flow are tested.

→ It requires programming knowledge and helps in optimizing performance, but it is time-consuming

iv) Black-Box testing

⇒ Black-box testing evaluates software functionality without looking at the internal code, focusing on user inputs and expected outputs.

→ It is useful for detecting missing requirements missing requirements but cannot identify internal code errors.

5. Explain software design concepts and design principles

i Abstraction :- Abstraction is the process of hiding implementation details and exposing only necessary functionality

ii Modularity :- The principle of dividing software into independent, self-contained modules that can be developed and tested seperately

iii Information hiding prevents direct access to internal components of a module, exposing only required interfaces.

iv Coupling :- The degree of interdependency between modules. Low coupling is preferred for maintainability.

v Cohesion . The degree to which elements within a module work together. High cohesion is desirable.

- Software Design Principle

i SOLID principle

⇒ Single Responsibility principle (SRP) :- A class should have only one reason to change

- O - Open/closed Principle (OCP)

→ Software entities should be open for extension but closed for modification.

- L - Liskov substitution principle (LSP)

→ A subclass should be replaceable with its parent class without affecting functionality

- I - Interface segregation principle (ISP)

→ clients should not be forced to depend on interfaces they do not use

- D - Dependency Inversion principle (DIP)

→ High-level modules should not depend on low level modules but rather on abstractions.

ii DRY (Don't Repeat Yourself)

→ Avoid code duplication by using functions, classes, or reusable modules.

iii YAGNI (You Ain't Gonna Need it)

→ Avoid implementing unnecessary features that are not required in the current scope.

6 What is Architectural Design and component level design? Explain in detail.

i Architectural Design

⇒ Architectural design is the high-level structure of a software system defining how components interact with each other. It serves as a blueprint for software development, focusing on the overall framework, modules, and their relationships.

1. Defines system structure :- Identifies the main components and their interaction in the system.

2. Specifies communication mechanisms :- Determines how modules communicate.

3. Ensures Scalability and Performance :- Helps in designing a system that handles growth efficiently

4. Improves Maintainability and Reusability :- promotes modular development for easy updates and code reuse.

For Ex. A banking system layers into UI Layer, Business Logic layer, DB layer.

ii Component-level Design

→ Component-level design focuses on designing individual software components within the architecture. A component is a self-contained module that provides specific functionality and can be reused.

1. Defines Functionality of Each Module:
   Specifies what each component does and how it interacts with others.

2. Encapsulation and Modularity:-
   Each component should be independent exposing only necessary data.

3. Data Flow between components:-
   Defines input, output and communication method.

4. Reusability:-
   Components should be designed for reuse in different parts of the application.

- For Ex, In library management system different components are:-
  - User Authentication component
  - Book management system
  - Transaction component.

7 Explain function oriented design and DFD with example of Library management system.

i Function - oriented Design

→ It is a top-down approach that focuses on designing the software based on functions (Process) rather than objects.

● → It decomposes a system into smaller functional modules, making it easier to manage and develop.

1 Modular Approach :- Breaks down the system into hierarchical functional modules.

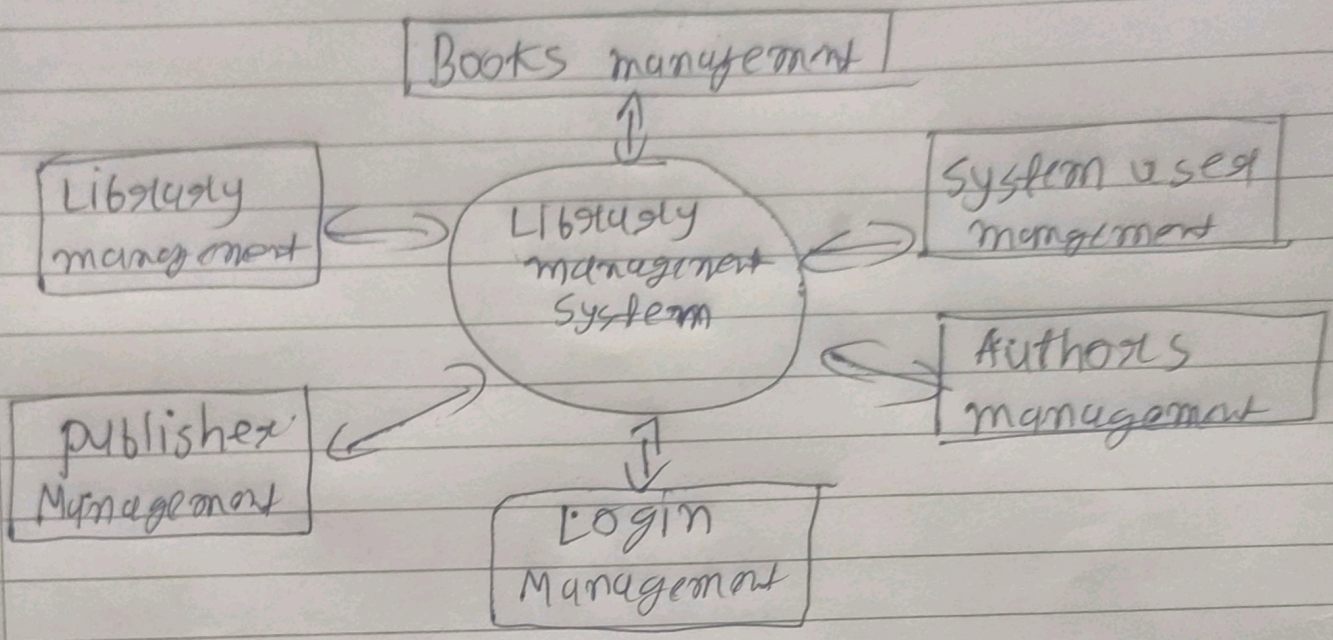
2. DFD :- Uses Data flow to represent data movement between modules.

● 3. Process - oriented :- Each function performs a specific task and interacts with data

ii Data Flow Diagram (DFD)

→ A DFD is a graphical representation of how data flows through a system, depicting processes, data stores, external entities, and data flow connections.

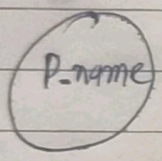
- Level zero dfd for Library management



8 What is Data flow diagram and leveling of DFD Draw Level 0, level 1 and level 2 for LMS

→ A DFD is a graphical representation of how data flows through a system. It shows the processes, external entities, data stores, and data movement within a system, helping in understanding how information is processed and transferred.

- Process

→ 

It is denoted by circle. Represents a function that transforms incoming data into outgoing data.

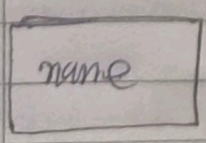
- Data Flow

→ It is denoted Arrow. Shows the movement of data between processes, data stores, or external entities.

- Data store

—— It is denoted within parallel lines. Represents
—— a place where data is stored

- Entity

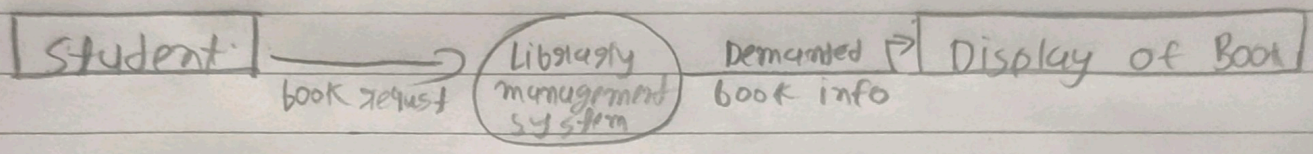


It is denoted by Rectangle. Represents sources or destinations of data outside the system.

→ DFD is designed in multiple levels starting from a high-level overview and progressively breaking it down into detailed components

1 Level 0 DFD

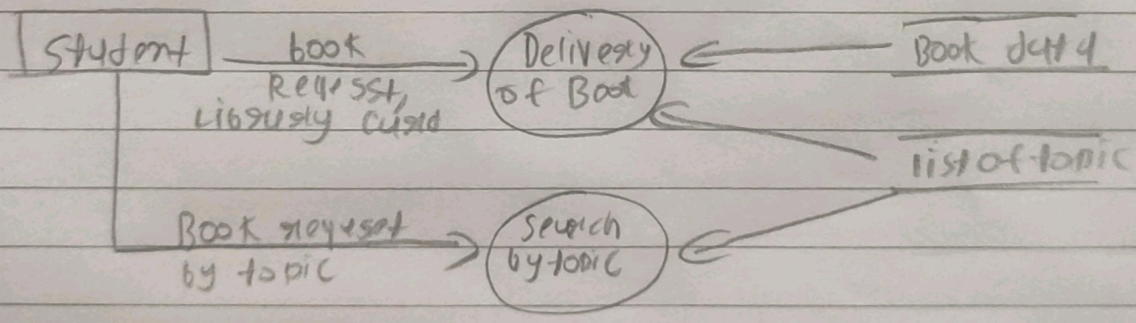
→ This is the highest level of DFD. Represents the entire system as a single process.



2 Level 1 DFD

→ Breaks down the single process from level 0 into main subprocesses.

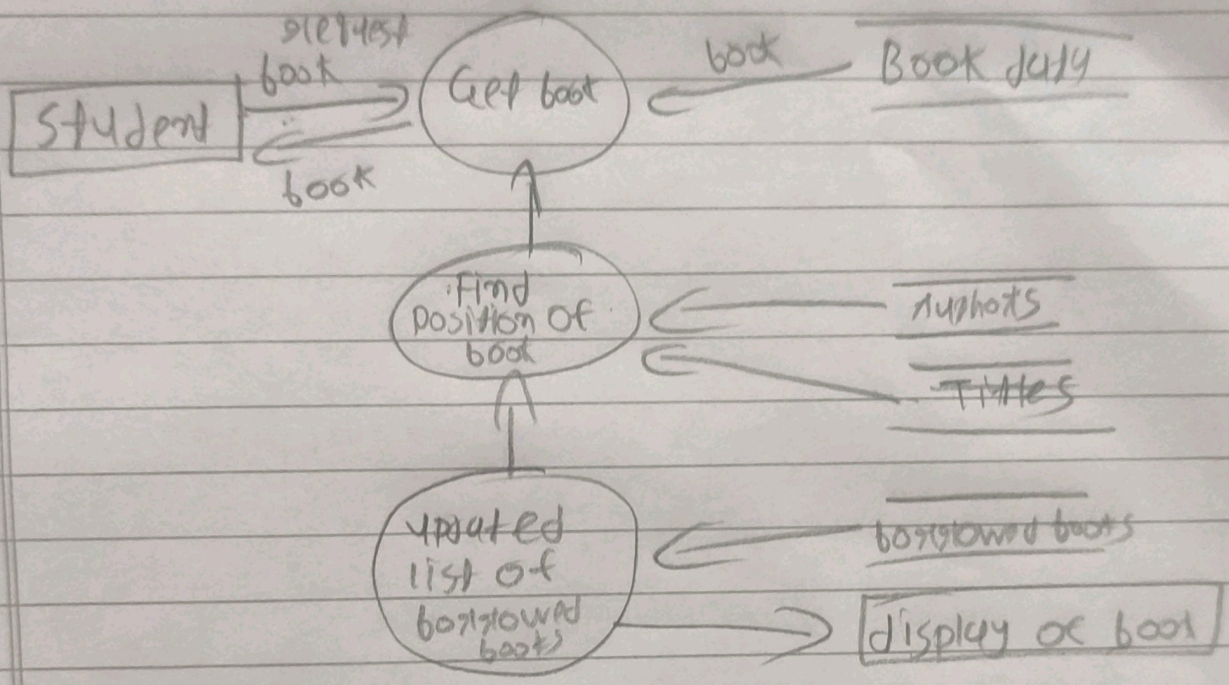
→ Shows how data moves between processes.



3 Level 2 DFD

→ Further breaks down the subprocesses from level 1 into more detailed steps.

→ Each process in level 1 is expanded to show specific actions within that proces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