Application software

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mermaid

graph TD

A[Start] --> B[Phase 1: Planning and Requirements Analysis];

B --> C{Feasibility Study};

C -- Yes --> D[Phase 2: System Design];

C -- No --> E[End];

D --> F[Phase 3: Implementation / Coding];

F --> G[Phase 4: Testing];

G -- Bugs Found? --> H{Fix Bugs};

H -- Yes --> F;

H -- No --> I[Phase 5: Deployment];

I --> J[Phase 6: Maintenance];

J --> K{New Requirements or Issues?};

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Use code with caution.

**Explanation of SDLC phases**

**Phase 1: Planning and requirements analysis**  
This initial phase lays the foundation for the entire project.

* **Key activities:** Project leaders and stakeholders gather inputs from customers, market surveys, and the sales department to define the project scope, objectives, and functionality.
* **Deliverable:** A Software Requirements Specification (SRS) document, which details the functional and non-functional requirements of the software.

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* **Key activities:** Designing the database, outlining the overall system structure, and creating mockups or wireframes for the user interface (UI).
* **Deliverable:** The Software Design Document (SDD), which serves as a roadmap for the development team.

**Phase 3: Implementation / Coding**  
The actual software development begins. Developers write the source code according to the design specifications using their chosen programming languages and tools.

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The Quality Assurance (QA) team tests the software to identify and fix any bugs or defects. This ensures the software meets the quality standards and functions as intended.

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This is an ongoing phase that continues throughout the software's lifespan. It involves managing changes, fixing bugs found by users, and implementing ongoing improvements.

* **Key activities:** Fixing bugs, issuing patches, releasing updates with new features, and monitoring system performance.
* **Outcome:** A continually evolving and optimized software product.

Q2 Write a requirement specification for a simple library management system.

ansA Requirement Specification for a simple Library Management System (LMS) outlines the system's purpose, features, user roles, and constraints. This document helps ensure the final product meets the needs of both library staff and patrons.

**1. Introduction**

**1.1 Purpose**

This document details the functional and non-functional requirements for a Simple Library Management System. The purpose of this software is to automate and streamline the key operations of a small library, such as managing the book catalog, processing book loans and returns, and handling member accounts.

**1.2 Scope**

The system will manage book and member data, facilitate the borrowing and returning of physical books, track overdue fines, and enable book searching. It will have distinct interfaces for library staff and library members.

**2. Overall description**

**2.1 User roles**

* **Librarian (Admin):** This user manages the entire system. Their responsibilities include adding/removing books and members, issuing/returning books, and generating reports.
* **Library Member (Patron):** This user can search for books, view their borrowing history, and see the status of their checked-out books.

**2.2 Functional requirements**

**Book management**

* **FR-1: Add new books.** The system must allow the Librarian to add new book records with details such as title, author, ISBN, and quantity.
* **FR-2: Update book details.** The Librarian must be able to edit the information of existing book records.
* **FR-3: Remove books.** The system must allow the Librarian to remove books from the catalog.
* **FR-4: Search for books.** The system must allow both Librarians and Members to search the catalog by title, author, or ISBN.
* **FR-5: View book status.** The system must display the availability status of a book, including the number of copies available.

**Member management**

* **FR-6: Register new members.** The Librarian must be able to add new members to the system, including their name, contact details, and a unique ID.
* **FR-7: Update member details.** The Librarian must be able to edit a member's information.
* **FR-8: View member details.** The Librarian can view a member's full borrowing history, including past and current loans.
* **FR-9: Member login.** Registered members must be able to log in to their accounts to view their profile and borrowing history.

**Circulation management**

* **FR-10: Issue a book.** The Librarian must be able to issue a book to a member, recording the issue date and due date.
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* **FR-13: Manage reservations.** Members can reserve a book if all copies are currently borrowed. The system will notify the member when the book becomes available.

**Reporting**

* **FR-14: Generate reports.** The Librarian must be able to generate reports on various library activities, such as:
  + **Issued Books Report:** A list of all books currently checked out.
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**2.3 Non-functional requirements**

**Usability**

* **NFR-1: User-friendly interface.** The system should be intuitive and easy for both librarians and members to use, with clear navigation and simple actions.

**Performance**

* **NFR-2: Search speed.** The system must return search results within 2 seconds for typical queries.
* **NFR-3: Scalability.** The system should be able to handle a growing number of books and members without significant performance degradation.

**Security**

* **NFR-4: User authentication.** All users must log in with a valid username and password to access the system.
* **NFR-5: Data security.** The system must protect sensitive user and library data from unauthorized access.
* **NFR-6: Data backup.** The database must be backed up regularly to prevent data loss.

**Reliability**

* **NFR-7: Availability.** The system should be highly reliable and available during library hours, with minimal downtime.
* **NFR-8: Error handling.** The system must handle errors gracefully and provide clear, understandable error messages to the user.

**Compatibility**

* **NFR-9: Multi-browser support.** The system should function correctly on all major web browsers (e.g., Chrome, Firefox, Safari).

**3. System features**

**3.1 Book database**

* **Attribute fields:** ISBN, Title, Author, Publisher, Year of Publication, Genre, and Total Copies.
* **Status:** Each copy of a book will have a status (e.g., "Available," "Checked Out," or "Reserved").

**3.2 Member database**

* **Attribute fields:** Member ID, Name, Email, Phone Number, and Borrowing History.

**3.3 Transaction database**

* **Attribute fields:** Transaction ID, Book ID, Member ID, Issue Date, Due Date, Return Date, and Fine Amount (if any).

Q3.Perform a functional analysis for an online shopping system

Ans   
create a flowchart representing the software development life cycle sdlc

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* The Seven Phases of the Software Development Life Cycle

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* A Guide to Software Development Life Cycle & its Process

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.

**User-facing functions**

**1. Product catalog and search**

* **Browsing:** Customers can view products categorized by type (e.g., electronics, clothing, books).
* **Searching:** A search bar allows users to find specific products by keywords, such as product name, brand, or features.
* **Filtering and sorting:** Users can refine their search results using filters for attributes like price range, size, color, and customer ratings. They can also sort results by relevance, price (high/low), or popularity.
* **Product details:** Clicking a product shows a dedicated page with detailed information, including high-quality images, descriptions, specifications, pricing, stock availability, and customer reviews.

**2. User account management**

* **Registration:** New users can create an account by providing an email address and a password.
* **Authentication:** Returning users can securely log in to access their personal information.
* **Profile management:** Users can update their personal information, shipping addresses, and payment methods.
* **Order history:** Users can view a complete history of their past orders and track the status of current orders.
* **Wishlist:** Users can add products to a wishlist for future purchase.

**3. Shopping cart and checkout**

* **Add/remove items:** Customers can add a product to their cart from the product page and remove it from the cart at any time.
* **Update quantity:** Users can adjust the quantity of items within the shopping cart.
* **Guest checkout:** The system allows users to complete a purchase without creating a registered account.
* **Promotions:** The system supports applying discount codes or vouchers during the checkout process.
* **Order summary:** The system displays a final order summary, including subtotal, taxes, shipping costs, and total price.

**4. Payment and shipping**

* **Payment processing:** The system integrates with secure payment gateways to process transactions via various methods (e.g., credit/debit cards, digital wallets).
* **Order confirmation:** After a successful transaction, the system sends an order confirmation via email or SMS.
* **Shipping tracking:** The system provides users with shipping information and a tracking number to monitor their delivery.

**Administrative functions**

**1. Product and inventory management**

* **Product administration:** A system administrator can add, update, and remove products from the catalog.
* **Inventory tracking:** The system automatically updates stock levels in real time as products are sold. It can also generate low-stock alerts.

**2. Order management**

* **Order processing:** Administrators can view and manage all placed orders, updating their status as they are processed (e.g., processing, shipped, delivered).
* **Cancellation and returns:** The system supports the processing of order cancellations and returns.

**3. Analytics and reporting**

* **Sales reports:** The system can generate reports on sales performance over specified time periods.
* **User behavior tracking:** It can track user behavior to provide insights into browsing patterns, popular products, and customer trends.

Q4.Design a basic system architecture for a food deleivery app

ansTo perform a functional analysis for a shopping system, you need to identify and outline the key features from the perspective of its users. This analysis typically involves two main user types: the customer and the administrator.

**Customer functions**

These are the features that enable a user to browse, select, and purchase products.

* **Product search and filtering:** Customers can search for items by name, category, or keywords and filter results by price, size, or other attributes.
* **Product catalog:** The system displays a wide range of products with details like images, descriptions, specifications, and prices.
* **User account:** A registered user can create, log in to, and manage their profile and store their preferences and addresses.
* **Shopping cart:** Users can add, remove, and manage items they intend to purchase, and the system automatically calculates the subtotal.
* **Checkout and payment:** The system facilitates a secure and multi-step checkout process that integrates with various payment methods.
* **Order tracking:** Users can view their order history and track the status of their current orders in real time.
* **Wishlist:** Customers can save items for future purchase.
* **Reviews and ratings:** Customers can leave feedback and rate products

**Administrator functions**

These are the internal operations and management capabilities available to the system administrators.

* **Inventory management:** Admins can add new products, update product details, and manage stock levels.
* **Order processing:** The system provides a dashboard for viewing and managing orders as they move through different stages (e.g., placed, shipped, delivered).
* **User management:** Admins can manage user accounts, including addressing issues and handling support requests.
* **Promotions:** Admins have the ability to create and manage special discounts and offers.
* **Reporting:** The system generates reports on sales, inventory, and other business analytics.

Q5.Develop test cases for a simple calculator program

ansFunctional test cases

* **Addition:** Verify

5+3=85 plus 3 equals 8

5+3=8

. Test with negative numbers (

-5+3=-2negative 5 plus 3 equals negative 2

−5+3=−2

) and decimals (

5.5+2.5=8.05.5 plus 2.5 equals 8.0

5.5+2.5=8.0

).

* **Subtraction:** Verify

10−4=610 minus 4 equals 6

10−4=6

. Test with negative numbers (

-10−(-5)=-5negative 10 minus open paren negative 5 close paren equals negative 5

−10−(−5)=−5

).

* **Multiplication:** Verify

7\*9=637 \* 9 equals 63

7\*9=63

. Test with zero (

7\*0=07 \* 0 equals 0

7\*0=0

).

* **Division:** Verify

20/4=520 / 4 equals 5

20/4=5

. Test with zero as the dividend (

0/5=00 / 5 equals 0

0/5=0

).

Edge case test cases

* **Large numbers:** Test addition or multiplication with very large numbers to check for overflow errors.
* **Decimal precision:** Test calculations involving decimals (e.g.,

0.1+0.20.1 plus 0.2

0.1+0.2

) to ensure accuracy.

* **Operator precedence (BODMAS):** Verify that chained operations follow the correct order (e.g.,

2+3\*4=142 plus 3 \* 4 equals 14

2+3\*4=14

).

* **Chained operations:** Test operations performed consecutively without clearing (e.g.,

5+65 plus 6

5+6

, then

\*2\* 2

\*2

).

Error handling test cases

* **Division by zero:** Input

5/05 / 0

5/0

and verify the system displays an error message like "Cannot divide by zero".

* **Invalid characters:** Input non-numeric characters (e.g., "5a+3") and confirm an error is shown.
* **Multiple operators:** Test inputting multiple operators in a row (e.g.,

5+\*25 plus \* 2

5+\*2

) to ensure it's handled gracefully.

**UI test cases**

* **Clear button:** Press the "C" or "AC" button to ensure the display resets to zero.
* **Backspace:** Verify that pressing the backspace key deletes the last entered digit.
* **t:** Press the equals button.

Q6.Document a real world case wher a software application required critical maintenance.

Ans A prime example of software requiring critical maintenance is the **Heartbleed vulnerability**.

* **What happened:** In 2014, a critical security bug was discovered in OpenSSL, a widely used cryptographic software library. The flaw allowed attackers to read the memory of servers, potentially stealing sensitive data.
* **The critical need:** Because OpenSSL secures a vast portion of internet traffic, countless websites, email servers, VPNs, and other software were vulnerable. The flaw could expose user passwords, session cookies, and the server's private keys, which allow for decryption of all past and future communications.
* **The maintenance required:** Software teams worldwide had to perform urgent maintenance to patch the bug by updating to a fixed version of OpenSSL. This was often not enough. Because a breach could not be ruled out, site administrators were also forced to:
  + Regenerate all server security certificates.
  + Invalidate old certificates.
  + Force users to change their passwords.
* **Impact:** This case demonstrated that a vulnerability in a single open-source component could trigger a massive, global critical maintenance effort with significant time, cost, and security implications across millions of applications.

Q7 .create a DFD for a hospital management system ?

Ans **Context diagram (DFD Level 0)**

This shows the entire hospital management system (HMS) as a single process interacting with external entities.

* **External Entities:** Patient, Doctor, Lab, Pharmacy, Administration.
* **Data Flows:**
  + Patient sends requests (e.g., appointment) and receives confirmations or bills.
  + Doctor sends diagnoses and prescriptions and receives patient histories.
  + Lab sends test results and receives lab requests.
  + Pharmacy sends drug orders and receives prescriptions.
  + Administration sends management data and receives reports.

**Level 1 DFD**

This diagram expands the central HMS process into its major functional components.

* **Processes:**
  + **Manage Appointments:** Handles scheduling and confirming appointments for patients and doctors.
  + **Manage Patient Records:** Stores, updates, and retrieves all patient information, diagnoses, and medical history.
  + **Manage Lab & Pharmacy:** Coordinates lab requests and results with prescriptions and drug dispensing.
  + **Manage Billing:** Processes payments, calculates costs from various departments, and generates patient bills.
* **Data Stores:**
  + **Patient Database:** Stores demographic information and appointment history.
  + **Medical Records Database:** Contains detailed medical history, diagnoses, and lab results.
  + **Billing Database:** Records financial transactions and billing information.
* **Data Flows:** Information flows between these internal processes, the data stores, and the external entities shown in the Level 0 DFD.

Q8. Build a simple desktop calculator application using gui library.

ans**GUI Library:** Tkinter (Python's built-in GUI toolkit).

**1. Main window**

* Create the main window using tkinter.Tk().
* Set a title, size, and background color.
* Make it non-resizable (resizable(0,0)).

**2. Display**

* Use a tkinter.Entry widget to create a display field for numbers and results.
* Configure it to be read-only so users can't type directly into it.
* Align the text to the right.

**3. Buttons**

* Create tkinter.Button widgets for numbers (0–9), arithmetic operators (+, -, \*, /), clear (C), and equals (=).
* Use a grid layout (.grid()) to position the buttons neatly.
* Bind each button to a function that appends its value to the display.

**4. Logic**

* Create a function (e.g., button\_click) to handle button presses, updating the display string.
* Create a separate function (e.g., calculate) for the equals button.
* Inside the calculate function:
  + Use Python's built-in eval() function to compute the result of the expression string.
  + Implement a try...except block for error handling, such as division by zero or invalid input.
  + Update the display with the final result or an error message.

**5. Run the app**

* Use root.mainloop() to start the event loop, which keeps the application running and responsive to user actions.

Q8 draw a flowchart representing the logic of a basic online registration system.

ansmermaid

graph TD

A[Start: User lands on registration page] --> B[User fills out required fields];

B --> C{Form submission};

C -- No --> B;

C -- Yes --> D{Is data valid?};

D -- No --> E[Display validation errors to user];

E --> B;

D -- Yes --> F{Check if username/email exists};

F -- Yes --> G[Display "Already registered" error];

G --> B;

F -- No --> H[Store user details in database];

H --> I[Generate verification link/code];

I --> J[Send verification email/SMS to user];

J --> K[Wait for user confirmation];

K --> L[Update user status as 'verified'];

L --> M[End: Redirect to login or home page];

```