

Name: _____

Score: _____

79 Multiple choice questions

Definition

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Web applications that load a single HTML page and dynamically update that page as the user interacts with the app.

- Dbms Concepts And Functions
- Static And Dynamic Modeling
- Roles Of Dba & Da
- Single Page Application(SPA)

Definition

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Algorithms are crucial for performing calculations, processing data, and solving specific problems in computing. They put the 'science' in computer science by enabling problem-solving through precise steps.

- Data Processors
- Programs
- Algorithms
- Operating Systems

Definition

Programming languages are classified based on their level of abstraction from machine learning language (low-level, close to hardware) to high-level languages (more abstract, close to human language). Each has its characteristics, such as syntax, semantics, and paradigms like structured, procedural, imperative, functional, or object-oriented.

 1.4 Software Implementation and Testing

Concepts and characteristics of programming languages

 1.3 Software analysis and design

Software requirement analysis

 Software architecture components frameworks **Integrated Development Environment (IDE)****Definition**

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Problem-solving in computing often involves finding efficient algorithms tailored for specific areas within computer science, such as machine learning or cryptography.

 Problem-solving methods and algorithms **Sorting algorithm** **Testing concepts and processes** **Concepts and Needs for Maintenance****Definition**

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A data structure is a storage format chosen for efficient access to data, which includes a collection of data values, the relationships among them, and the functions or operations that can be applied to the data.

 Design of relationships **Data processing types** **Definition of data structure** **Basic concepts of software architecture**

Definition

Involves server-side scripting and database management using technologies such as Java Server Page(JSP), Application Service Provider(ASP), and Python.

 Major programming languages **Coding rules** **Software reuse** **Back-end web development****Definition**

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An approach where a single application is built as a suite of small services, each running in its own process and communicating with lightweight mechanisms.

 Microservices **Monolithic Architecture** **Conducting Refactoring** **Microservice Architecture****Definition**

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- Databased Administrator - Manages database construction, operation, design, and tuning.
- Database Architect - Establishes data standards, modeling and security systems.

 Roles of DBA & DA **Activities for SCM** **XML Documents** **4 Types of Maintenance**

Definition

IEEE-1471 provides guidelines for the description of software architectures, and Architecture Tradeoff Analysis Method(ATAM), Cost-Benefit Analysis Method(CBAM) are methods for evaluation the qualities of software architecture.

- Software Configuration Management**
- Software architecture components frameworks**
- Linear data structures: List, Stack and Queue**
- Software reuse**

Definition

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- Definition - A system to manage databases including DBMS, data, hardware, and users.
- Components - Database, Database Management System(DBMS), Data processing language, Users.

- Basic concepts of software architecture**
- 3-Level Database Architecture(ANSI-SPARC)**
- Database System Concept and Components**
- Database Concept and Features**

Definition

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Non-linear data structures such as trees and graphs allow elements to have multiple relationships with each other. Trees consist of nodes connected in a hierarchical manner, while graphs consist of nodes connected by edges without any hierarchy.

- Cohesion and Coupling as module design criteria**
- 3-Level Database Architecture(ANSI-SPARC)**
- Software architecture components frameworks**
- Non-Linear data structures: Tree & Graph**

Definition

Algorithms are classified by the problems they solve, such as searching and sorting data, or by the strategies they use like dynamic programming and greedy methods.

○ Platform as a Service-based Software Development**○ Classification of algorithms: Sorting, Searching, Dynamic Programming, & Greedy algorithm****○ 3-Level Database Architecture(ANSI-SPARC)****○ Algorithms****Definition**

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•Linear structures include elements arranged in a sequential order; while

•Non-Linear structures have elements that are not arranged sequentially and can be connected to multiple elements.

○ Cohesion and Coupling as module design criteria**○ Linear data structures: List, Stack and Queue****○ 1.2 Data Structure and Algorithm****Data Structures****○ Types of Data Structure - Linear & Non-Linear****Definition**

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Software Requirements Specification(SRS), Software System Requirements(SyRS), User Requirements Specification(URS) documents are prepared to capture all the details.

○ Strategies for project management in software development**○ Methods for coding software applications****○ Techniques for debugging software errors****○ Types of requirements specification documents**

Definition

It is defined as the process that involves designing, developing, testing, and maintaining software. It is an engineering discipline that applies engineering principles to software development, aiming to produce software that is reliable, efficient, and meets the requirements of users or businesses.

O software Configuration Management**O 1.1 Software Engineering****O software reuse****O 1.5 software requirements management****Definition**

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Requirements management and requirement engineering ensure that the organization understands and documents what the software should do, aligns the software functionalities with business goals, and maintains this understanding throughout the project lifecycle.

O Frameworks for Project Management and Delivery**O Principles of Software Testing and Quality Assurance****O Techniques for User Interface Prototyping****O Concepts and Processes of Software Requirements Management****Definition**

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Emphasize aspects like abstraction, encapsulation, inheritance, and polymorphism and apply design principles such as Single Responsibility Principle(SRP), Open/Closed Principle(OCP), Liskov Substitution Principle(LSP), Interface Segregation Principle(ISP), Dependency Inversion Principle(DIP), and Don't Repeat Yourself(DRY).

O Back-end web development**O Software design principles****O Test case design methods****O Object-oriented design principles**

Definition

Open source software(OSS) is characterized by its license, which allows users to freely access, modify, and distribute the source code. OSS fosters collaborative software development and is often developed in a public, collaborative manner.

later trends in software development

1.3 software analysis and design

- software requirement analysis

concepts and processes of software requirements management

1.6 Trends in Software Development

- Concept

Definition

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•Concepts of Data Modeling - Understanding the abstraction of real-world entities into a database structure.

> Conceptual - High-level, technology-agnostic organization of data.

> Logical - Specific to the data model(e.g., relational), often includes normalization.

> Physical - How the model will be implemented in a specific DBMS.

Database Model

Data Exploration

Data Mining

Data Modeling

Definition

Structured analysis tools - Context diagrams, Data Flow Diagrams(DFDs), Data Dictionary(DD), and mini-specifications are used to represents the processes, data stores, and data flows in a system.

Structured analysis

Classical analysis

Baseline

All of others

Definition

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Techniques like inspection, walk-throughs, and technical reviews are used to verify that the requirements are complete, consistent, unambiguous, verifiable, and compliant with standards.

Software design principles

Requirements verification

Requirements checking

In-process review

Definition

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Include decomposition, abstraction, information hiding, stepwise refinement, modularity, and structuralization which guide the organization and modularization of software systems.

Software design principles

Software reuse

Software configuration management

Composite/structured design

Definition

- XML-based Data Definition - Structures for defining data like XML Schema and DTD.
- XML Data Processing - Technologies for working with XML, such as XPath, XQuery, and XLink.

 Roles of DBA & DA **Data Model and Database Structure** **Requirements verification** **XML Documents****Definition**

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Software testing is a process to evaluate the functionality of a software application to ensure it meets the specified requirements.

 Testing concepts and processes **Dbms concepts and functions** **Problem-solving methods and algorithms** **Software Maintenance****Definition**

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Utilizes UML to represent static aspects like classes and attributes, and dynamic behaviors like interactions and state change of the system.

 File processing systems **Sorting algorithm** **Object-relational database** **Static and dynamic modeling**

Definition

An indicator of potential refactoring, pointing towards areas in the code that could be problematic and may need improvement.

 Sorting algorithm **Code smell** **Software reuse** **Greedy algorithm****Definition**

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- Background - The need to modify the schema at one level without altering the other levels.
- Logical Independence - Changing the conceptual schema without affecting external views.
- Physical Independence - Changing the internal schema without affecting the conceptual schema.

 Database Concept and Features **XML Documents** **Data Independence** **Data Modeling****Definition**

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Focus on creating designs that are consistent, provide appropriate user support, offer adequate feedback, require minimum user input, and have simple error handling.

 Requirements verification **1.1 software engineering** **Principles of UI/UX design** **Design of relationships**

Definition

Linear data structures like arrays, stacks, and queues store elements in a specific order that allows efficient access and modification. Arrays store elements in contiguous memory locations, stacks follow (LIFO) order, and queues follow (FIFO) order.

O Types of Data Structure - Linear & Non-Linear**O Linear data structures: List, Stack and Queue****O Non-Linear data structures: Tree & Graph****O Requirements Traceability Management****Definition**

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Software maintenance is the process of updating, refining and patching software to fix bugs, improve performance, or adapt to new environments.

O Software Reuse**O Proprietary Licensing****O Software Development****O Software Maintenance****Definition**

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• Software reuse is not just about reusing code; it can also mean reusing software design, patterns, user manuals, and more.

• Reuse can be as simple as copying and pasting code or as complex as integrating large systems.

• Component-based development is an aspect of software reuse that involves using self-contained components to build applications.

O Testing concepts and processes**O Data Modeling****O Various Database Systems****O Key points to note:**

Definition

Requirements management involves gathering, analyzing, documenting, and maintaining software requirements. It's a process to ensure that deliverables meet stakeholder expectations and it's often divided into collection, analysis, and documentation phases.

O 4.2 Agile Methodologies Overview**O 1.5 Software Requirements Management****O 2.0 Software Development Lifecycle****O 3.5 user experience design principles****Definition**

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- Definition - A framework for database abstraction layers such as External, Conceptual, and Internal.
- Background Idea - To separate user applications from the physical database.

O DBMS Concepts and Functions**O Types of Data Structure - Linear & Non-Linear****O 3-Level Database Architecture(ANSI-SPARC)****O Software Configuration Management****Definition**

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- Batch Processing - Collecting data and processing it in large batches at a later point.
- Online Processing - Immediate processing of data as it is entered or received.
- Distributed Processing - Processing data across multiple computers or locations.

O Object-oriented analysis**O Data Processing Types****O Structured analysis****O Data Modeling**

Definition

- Definition and classes of software requirements(ISO 29148) - Software requirements are a detailed description of what a software system should do. ISO 29148 is the international standard for the processes and products of requirements engineering, including the definition and management of requirements.
- Software requirements elicitation methods - These are the techniques used to gather requirements from stakeholders and users, like interviews, questionnaires, user observation, workshops, brain storming, role-playing, and prototyping.
- Analysis of software requirements - Involves structured analysis and object-oriented analysis to ensure that the requirements are actionable, measurable, testable, related to identified business needs or opportunities, and defined to a level of detail sufficient for system design.
- Specifications of software requirements - The process of documenting the requirements and involves the description of the system's services, constraints, and how it will react to specific inputs of conditions.

1.5 Software Requirements Management

Software Maintenance Activities

Software Configuration Management

1.3 Software analysis and design

Software requirement analysis

Definition

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- Unstructured Database - Databases for documents, multimedia, GIS, etc..
- Main Memory Database Management System(MMDBMS) - Databases primarily stored in main memory.
- Row-oriented/Column-oriented DBMS - Databases optimized for row or column storage.
- Embedded DBMS - DBMS embedded within an application.
- Mobile DBMS - DBMS for mobile environments.

1.1 Software Engineering

Various Database Systems

3-Level Database Architecture(ANSI-SPARC)

Structured analysis

Definition

Search algorithm locate or retrieve an element from a data structure and are classified into sequential or interval searches based on the search operation.

 Selection sort **Linear search** **Baseline** **Search algorithm****Definition**

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•Models - Hierarchical, Network, Relational, Object-oriented, Object-relational.

•History and Application Areas - Evolution of database models and their use cases.

 Back-end web development **Problem-solving methods and algorithms** **Data Model and Database Structure** **Software Maintenance Activities****Definition**

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The need for maintenance arise from the requirement to correct faults, improve performance, and other attributes after delivery.

 User Experience Testing Methods **Concepts and Needs for Maintenance** **Software Development Life Cycle Phases** **Programming Languages and their Features**

Definition

Includes specification-based(e.g., Equivalence partitioning, Boundary value analysis) and structure-based methods(e.g., Control flow testing).

Static and dynamic modeling

Back-end web development

Design of Relationships

Test case design methods

Definition

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Activities include configuration identification, control, status reporting, auditing, and handling the evolution of software configurations.

Activities for SCM

Licences

Design of Relationships

Software Configuration Management

Definition

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Proficiency in languages such as C, C++, Java, and Python is crucial for various software development tasks.

Software configuration management

Object-Relational Database

Back-end web development

Major programming languages

Definition

This includes managing changes to software artifacts, establishing baselines, and revision control. The activities ensure that the software development is organized and systematic, preventing chaos in the development process.

O Best Practices for Database Management**O Concepts and Activities of Software Configuration Management****O Principles of User-centered Design****O Guidelines for Effective Software Testing****Definition**

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- General Public License(GPL) - Requires derivatives of the code to be open source as well.
- Lesser General Public License(LGPL) - Allows linking to proprietary modules, offering more flexibility than GPL.
- Mozilla Public License(MPL) - Permits the combination of MPL-licensed code with proprietary code in larger works.
- Berkely Software Distribution(BSD) - Offers minimal restrictions on future behavior, allowing for proprietary use of the code.
- Apache - Include explicit patent grants and a patent retaliation clause, protecting against patent trolling.

O Data Independence**O Algorithms****O DBMS Concepts and Functions****O Licences**

Definition

- Concept - A collection of integrated, stored, operational, and shared data.
- Features - Real-time accessibility, continuous evolution, concurrent sharing, content reference.

O Software Maintenance Activities**O Database Concept and Features****O Software Configuration Management****O DBMS Concepts and Functions****Definition**

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Change management includes analyzing the effects of proposed changes(side and ripple effects), and making decisions via a change control board to manage these changes effectively.

O Concepts Of Refactoring**O Sorting Algorithm****O Requirements Change Management****O Conducting Refactoring****Definition**

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Maintenance is not just about fixing bugs; it includes enhancements and adaptations to meet evolving user needs or operating environments.

O User Interface Design Guidelines**O Basic Principles of Software Development****O Concepts and Types of Software Maintenance****O Common Software Bugs and Fixes**

Definition

Configuration management is about organizing and controlling the development process, ensuring that changes are made systematically and that the integrity of the current software state is maintained.

- Requirements Tracing
- Software Configuration Management
- Change Management
- Developer Workload Management

Definition

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White-box testing involves looking inside the structure of the application, while black-box testing is based on testing software from the user's perspective without looking at the internal structure.

- Software configuration management
- White-box and black-box testing
- Data model and database structure
- Design of entities, attributes and identifiers

Definition

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Greedy algorithm make the optimal choice at each step, aiming to find the overall optimal way to solve the entire problem,. They are used in optimization problems where the best possible solution is desired.

- Dynamic programming
- Prim's algorithm
- Greedy algorithm
- Quick sort algorithm

Definition

- Definition - Software for creating and managing databases.
- Functions - Data storage, retrieval, update, and administration of databases.
- Components - Query language processor, transaction manager, stored data manager, data catalog.

O DBMS Concepts and Functions**O Database Concept and Features****O 3-Level Database Architecture(ANSI-SPARC)****O Object-oriented analysis****Definition**

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Concepts and Features - A DB that integrates features of both object-oriented and relational DBs.

O Network Database**O Object-Relational Database****O Data Modeling****O Entity****Definition**

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are ways to store and organize data on a computer so that it can be accessed and updated efficiently. They are not only used for organizing the data but also for processing, retrieving, and storing it.

O data model and database structure**O definition of data structure****O linear Data Structures: list, Stack And Queue****O 1.2 Data Structure and Algorithm****O Data Structures**

Definition

Refers to the fundamental organization of a system embodied in its components, their relationships to each other, and to the environment, and the principles guiding its design and evolution.

- Fundamentals of software testing methodologies**
- Basic concepts of software architecture**
- Principles of user interface design**
- Overview of programming languages and their syntax**

Definition

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Object-oriented analysis tools - Scenarios, Domain models, and Use-case models are developed, often utilizing UML diagrams like Use case diagrams, Class diagrams, Sequence diagrams, Activity diagrams to model the system from an object-oriented perspective.

- Object-oriented design**
- Object-oriented analysis**
- Object-oriented paradigm**
- Structured analysis**

Definition

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Involves HTML5, CSS3, JavaScript, AJAX, REST, JSON for creating the user interface and user experience.

- Front-end web development**
- Back-end web development**
- Major programming languages**
- Software reuse**

Definition

- Database Construction Procedure - Steps to create a database, from initial analysis to final implementation.
- Design Considerations
 - > Analysis Work Products - Documentation of requirements and specifications.
 - > Principal Personnel - Roles and responsibilities in design team.
 - > Impact of Design - How design choices affect functionality and performance.

 Object-oriented design principles **2.2 Database Design**
Databased Design and Building Procedure **Integrated Development Environment (IDE)** **1.4 Software Implementation and Testing**
Concepts and characteristics of programming languages**Definition**

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provides a platform allowing customers to develop, run, and manage applications without the complexity of building and maintaining the infrastructure typically associated with developing and launching an app.

 Cloud Storage Solutions for Data **Network Security Protocols** **Platform as a Service-based Software Development** **Traditional Software Development Models**

Definition

Tools like Source Code Control System(SCCS), Version Control System(CVS), Subversion(SVN), GIT, TFS, ClearCase, and RTC are used to manage configurations efficiently.

O Design of Relationships**O Dbms Concepts and Functions****O Coding Rules****O Use of SCM Tools****Definition**

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The four types are corrective, adaptive, perfective, and preventive maintenance, each addressing different needs of the software life cycle.

O software testing techniques**O project management methodologies****O 4 Types of Maintenance****O user Feedback collection Strategies****Definition**

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Establishing connections between entities, considering various types of relationships like recursive and parallel.

O Design of Entities, Attributes and Identifiers**O 4 Types of Maintenance****O Design of Relationships****O Design tools for UI/UX**

Definition

Standards such as C/C++ coding standards from Capability Maturity Model(CMU), Java standards from Oracle, and MISRA C/C++ ensure consistency, maintainability, and reliability in programming.

 Coding conventions **Sorting algorithm** **Coding rules** **Baseline****Definition**

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Refactoring is the process of restructuring existing computer code without changing its external behavior to improve its non-functional attributes.

 Concepts of refactoring **Concepts and types of software maintenance** **Basic concepts of software architecture** **Requirements change management****Definition**

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• Cohesion - Measures the degree to which the elements inside a module belong together. Higher cohesion is better.

• Coupling - Refers to the degree of interdependence between modules. Lower coupling is better.

 White-box and black-box testing **Concepts and Needs of Software Configuration Management(SCM)** **Cohesion and Coupling as module design criteria** **Concepts and Types of Software Maintenance**

Definition

These activities involve the actual tasks required to fix, update, and improve the software post-deployment to ensure its relevance and efficiency over time.

 Software Maintenance Activities **Software development frameworks** **Design Of Entities, Attributes And Identifiers** **Software Reuse****Definition**

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Frameworks like the Spring framework for Java development, Android framework for mobile applications, eGovernment Standard Framework(Korea) provide structured ways to build software applications.

 1.5 software requirements management **Software development frameworks** **Software reuse** **Software design principles****Definition**

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Tailoring the structure of the data to fulfill the requirements.

 Software Testing and Quality Assurance **Design of Entities, Attributes and Identifiers** **Database Management Systems Overview** **Data Encryption Techniques**

Definition

Baselines are reference points in the software development life cycle such as Functional, Allocated, Design, Test, Product, and Operation baselines, marking the transition from one phase of development to the next.

Feasibility Study

Pulse Repetition Frequency

Baseline

Auditing

Definition

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Includes activities such as defining magic numbers, removing comments and duplicated code, and extracting methods to improve code readability and maintainability.

Data processing types

Conducting refactoring

Sorting algorithm

Requirements change management

Definition

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SCM is needed to manage, organize, and control changes during the Software Development Life Cycle, which increases productivity and minimizes errors.

Overview of Software Development Methodologies

Concepts and Needs of Software Configuration Management(SCM)

Fundamentals of Cloud Computing Services

Techniques for Data Analysis and Reporting

Definition

Sorting algorithms rearrange data into a specific order, such as numerical or lexicographical order, which is crucial for the efficiency of other algorithms.

Binary search

Sorting algorithm

Coding rules

Software reuse

Definition

- Blockchain - Beyond cryptocurrency, used in supply chain, accounting systems, intellectual property protection, and secure e-voting.
- Cloud Computing - Facilitates collaboration, with increased use of cloud-native solutions for app development and remote work infrastructure.
- Python - Has become a leading programming language especially for AI and machine learning-based software solutions.
- TensorFlow & AI - TensorFlow, an open-source AI framework, is significant for developing intelligent models and algorithms.
- Infrastructure as Code(IaC) - Automates the management of computing resources, ensuring apps are deployed according to security standards.
- DevSecOps - Integrates security practices into the development cycle from the start, evolving from the traditional DevOps practices.
- Outsourcing - There's a significant growth in demand for outsourcing IT services, driven by cost efficiency and access to talent.
- Low-Code/No Code(LCNC) - Enables rapid development through graphical interfaces, allowing those with minimal coding skills to develop apps.
- Progressive Web Applications(PWAs) - Cost-efficient and improve user engagement without the need for app store downloads.
- React Native - Continues to be popular for hybrid app development, offering high performance and a near-native user experience.
- Internet of Things(IoT) - Expanding in digital twin technology and edge computing, affecting various business sectors.
- Internet of Behavior(IoB) - Collects "digital dust" to understand and predict human behavior, though it faces privacy legislation challenges.
- Web #.) - Involves AI, machine learning, cryptocurrencies, and aims to create a more autonomous and user empowered internet.

○ Later Trends in Software Development

○ DBMS Concepts and Functions

○ 1.6 Trends in Software Development

- Concept

○ 3-Level Database Architecture(ANSI-SPARC)

Definition

Tools like Personas, Wireframes, Mockups, Prototypes, and Storyboards are used to visualize and test the design before full-scale development.

 Requirements verification **Design tools for UI/UX** **Activities for SCM** **Software design principles****Definition**

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• Concepts - Organizing and storing data in files.

• Features and Problems - Data dependency, duplication issues, and integrity constraints.

 File Processing Systems **Data Processing Types** **Test case design methods** **Design tools for UI/UX****Definition**

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• Data - Raw, unprocessed facts.

• Information - Processed data that's been organized or structured.

• Knowledge - Applied information, used for decision-making and generalizations.

 2.2 Database Design**Databased Design and Building Procedure** **2.1 Understanding the Data and Database****Understanding Data** **Concepts and Needs of Software Configuration Management(SCM)** **1.2 Data Structure and Algorithm****Data Structures**

Definition

- Components of IDE - Includes source code editor, build automation tools, and debugger.
- Continuous Integration(CI) - A practice that encourages developers to integrate their code into a shared repository frequently.
- Software build and deployment - Processes involved in compiling code into executable programs, packaging these programs, and deploying them to the production environment.

○ Software development frameworks**○ 2.2 Database Design****Databased Design and Building Procedure****○ Concepts and Types of Software Maintenance****○ Integrated Development Environment (IDE)****Definition**

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Changes in requirements are inevitable and must be systematically managed to minimize project disruption and maintain quality. This involves identifying, analyzing, tracking, and approving changes to requirements.

○ Management and Tracking of Requirement Changes**○ Approaches to Risk Assessment in Projects****○ Strategies for Effective Team Collaboration****○ Methods for Software Performance Optimization**

Definition

Is a strategy in software engineering where existing software is used in the development of new software. This includes the direct incorporation of an entire application system, component-based development, or developing application families. The goal is to improve the quality, efficiency, and maintainability of software projects by leveraging existing assets, thus reducing development costs and time.

O Sorting Algorithm**O 1.1 Software Engineering****O Software Reuse****O Data Modeling****Definition**

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Traceability refers to the ability to trace requirements through the forward (from requirements to deliverables) and backward (from deliverables to requirements) directions, often using a traceability matrix to record and track the requirements.

O Requirements Change Management**O Software Configuration Management****O Requirements Traceability Management****O Various Database Systems**