Practice Question (MID I)

Theory – Concepts

1. Software Design Methodologies

Questions:

1. **What is the main focus of the Structured (Function-Oriented) Design approach?**
    - **Answer**: It focuses on **procedures and functions**, decomposing the system into processes and tasks. Tools like **DFD (Data Flow Diagrams)** and **Flowcharts** are used.
2. **Why is Object-Oriented Design (OOD) suitable for modeling real-world systems?**
    - **Answer**: OOD uses **objects** to represent real-world entities, making it natural to model systems like **online shopping platforms** or **library management systems**.
3. **What is the key advantage of Component-Based Design?**
    - **Answer**: It promotes **modularity** and **reusability** by dividing the system into **predefined, reusable components**.
4. **When should Formal Methods be used in software design?**
    - **Answer**: Formal Methods are used for **safety-critical systems** (e.g., aerospace, medical devices) where **mathematical verification** is required to ensure correctness.
5. **What is the main drawback of the Structured Design approach?**
    - **Answer**: It leads to **interdependencies** between functions and lacks **reusability** because data is not attached to functions.
6. **How does Data-Oriented Design differ from Object-Oriented Design?**
    - **Answer**: Data-Oriented Design focuses on **efficient data organization and processing**, while OOD focuses on **objects** that encapsulate data and behavior.
7. **Give an example of a system where Component-Based Design would be ideal.**
    - **Answer**: A **Content Management System (CMS)**, where components like **user authentication**, **content creation**, and **content management** can be developed and reused independently.

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2. SDLC Models

Questions:

1. **What is the main advantage of the Waterfall Model?**

- **Answer**: It is **simple and easy to manage**, making it ideal for small, well-defined projects.

2. **Why is the V-Model suitable for safety-critical systems?**
    - **Answer**: It emphasizes **testing at every stage**, ensuring high reliability and correctness.
3. **What is the key feature of the Iterative Model?**
    - **Answer**: It develops the system in **repeated cycles (iterations)**, allowing for continuous refinement based on feedback.
4. **When should the Spiral Model be used?**
    - **Answer**: For **large, high-risk projects** (e.g., defense, aerospace) where **risk management** is critical.
5. **What is the main disadvantage of the Prototyping Model?**
    - **Answer**: It can lead to **scope creep** and may not be suitable for **large-scale systems**.
6. **Why is Agile (Scrum) suitable for dynamic environments?**
    - **Answer**: It allows for **frequent releases** and **continuous feedback**, making it adaptable to changing requirements.
7. **Give an example of a project where the Incremental Model would be ideal.**
    - **Answer**: A **messaging app** where basic features (e.g., texting) are delivered first, followed by advanced features (e.g., voice calls, video calls).

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3. Requirements Engineering

Questions:

1. **What is the difference between User Requirements and System Requirements?**
    - **Answer**: User Requirements describe **what the system should do** in natural language, while System Requirements provide **detailed technical specifications**.
2. **Why are requirements important in software development?**
    - **Answer**: They provide **clear goals**, avoid **miscommunication**, ensure **quality**, and help with **legal compliance**.
3. **What is the main challenge in Requirements Engineering?**
    - **Answer**: Stakeholders often **don't know what they really want**, leading to **ambiguous or incomplete requirements**.
4. **What is the purpose of the Requirements Validation phase?**
    - **Answer**: To ensure the requirements **meet stakeholder needs** and are **feasible** to implement.
5. **What are the risks of insufficient requirements?**

- **Answer**: Risks include **insufficient user involvement**, **creeping requirements**, **ambiguous requirements**, and **poor quality**.

6. **Give an example of a Functional Requirement for an online banking system.**
    - **Answer**: "The system shall allow users to transfer money between their accounts."
7. **What is the difference between a Need and a Want in requirements?**
    - **Answer**: A **Need** is something essential (e.g., secure login), while a **Want** is something desirable but not critical (e.g., customizable themes).

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4. Stakeholder Identification

Questions:

1. **Who are stakeholders in a software project?**
    - **Answer**: Anyone with an interest in the project's success, including **customers**, **developers**, **managers**, and **end-users**.
2. **Why is stakeholder identification important?**
    - **Answer**: It ensures that **all perspectives** are considered, reducing the risk of **missing key requirements**.
3. **Identify stakeholders for a hospital management system.**
    - **Answer**: Patients, doctors, nurses, IT staff, hospital administrators, and insurance companies.
4. **What is the role of a Product Owner in Agile projects?**
    - **Answer**: The Product Owner represents the **customer** and defines the **product backlog** (list of features).
5. **Give an example of a stakeholder for a train protection system.**
    - **Answer**: Train passengers, train drivers, railway safety authorities, and train operating company management.
6. **What challenges can arise from conflicting stakeholder requirements?**
    - **Answer**: Conflicting requirements can lead to **delays**, **increased costs**, and **dissatisfied stakeholders**.
7. **Why is it important to involve end-users as stakeholders?**
    - **Answer**: End-users provide **valuable feedback** on the system's usability and functionality, ensuring it meets their needs.

6. Non-Functional Requirements

Questions:

1. **What are Non-Functional Requirements?**
    - **Answer**: Constraints on the system's **behavior**, **performance**, and **development process** (e.g., security, usability, reliability).
2. **Give an example of a Performance Requirement.**
    - **Answer**: "The system shall handle 10,000 concurrent users without performance degradation."
3. **What is the difference between Product Requirements and Organizational Requirements?**
    - **Answer**: Product Requirements specify **system behavior** (e.g., performance), while Organizational Requirements are derived from **policies and procedures** (e.g., development standards).
4. **Why are Non-Functional Requirements important?**
    - **Answer**: They ensure the system meets **quality standards**, **user expectations**, and **regulatory requirements**.
5. **Give an example of a Usability Requirement.**
    - **Answer**: "The system shall provide tooltips and tutorials for first-time users."
6. **What is the purpose of Security Requirements?**
    - **Answer**: To ensure the system **protects data** and **prevents unauthorized access** (e.g., "The system shall use two-factor authentication for login").
7. **What is the difference between Reliability and Performance Requirements?**
    - **Answer**: Reliability focuses on **system uptime** and **failure rates** (e.g., "The system shall have 99.9% uptime"), while Performance focuses on **speed** and **efficiency** (e.g., "The system shall process transactions in less than 5 seconds").

--Scenario Based Questions--

1. Software Design Methodologies

1. **Scenario**: A company is developing a **hospital management system** that needs to handle patient records, appointments, and billing. Which **software design methodology** should they use, and why?
    - **Answer**: **Object-Oriented Design (OOD)**. It allows for modeling real-world entities like **patients**, **doctors**, and **appointments** as objects, making the system modular and reusable.
2. **Scenario**: A startup is building a **new e-commerce platform** with evolving requirements. Which **software design methodology** would be most suitable, and why?
    - **Answer**: **Component-Based Design**. It allows the system to be divided into reusable components like **user authentication**, **product search**, and **payment processing**, making it flexible and scalable.
3. **Scenario**: A team is developing a **banking system** that requires high reliability and correctness. Which **software design methodology** should they use, and why?
    - **Answer**: **Formal Methods**. It uses mathematical techniques to ensure the system meets safety and security standards, which is critical for banking systems.
4. **Scenario**: A company is building a **content management system (CMS)**. Which **software design methodology** should they use, and why?
    - **Answer**: **Component-Based Design**. The CMS can be divided into reusable components like **user authentication**, **content creation**, and **content management**, making it modular and efficient.
5. **Scenario**: A team is developing a **video game** with complex interactions between characters and environments. Which **software design methodology** should they use, and why?
    - **Answer**: **Object-Oriented Design (OOD)**. It allows for modeling characters, environments, and interactions as objects, making the system flexible and easy to extend.
6. **Scenario**: A company is building a **real-time stock trading system**. Which **software design methodology** should they use, and why?
    - **Answer**: **Data-Oriented Design**. It focuses on efficient data organization and processing, which is critical for handling real-time stock data.
7. **Scenario**: A team is developing a **mobile app for fitness tracking**. Which **software design methodology** should they use, and why?
    - **Answer**: **Object-Oriented Design (OOD)**. It allows for modeling real-world entities like **users**, **workouts**, and **goals** as objects, making the system modular and reusable.

2. SDLC Models

1. **Scenario**: A company is developing a **payroll system** with well-defined requirements. Which **SDLC model** should they use, and why?
    - **Answer**: **Waterfall Model**. It is ideal for small, well-defined projects with stable requirements.
2. **Scenario**: A team is building a **new social media platform** with evolving requirements. Which **SDLC model** should they use, and why?
    - **Answer**: **Agile (Scrum)**. It allows for iterative development and frequent feedback, making it adaptable to changing requirements.
3. **Scenario**: A company is developing a **flight control system** for an aircraft. Which **SDLC model** should they use, and why?
    - **Answer**: **V-Model**. It emphasizes testing at every stage, ensuring high reliability and correctness, which is critical for safety-critical systems.
4. **Scenario**: A startup is building a **new mobile app** with unclear requirements. Which **SDLC model** should they use, and why?
    - **Answer**: **Prototyping**. It allows for creating a quick, basic version of the app to gather user feedback and refine requirements.
5. **Scenario**: A team is developing a **train protection system** that must be highly reliable. Which **SDLC model** should they use, and why?
    - **Answer**: **Spiral Model**. It focuses on risk management and iterative development, making it suitable for high-risk projects.
6. **Scenario**: A company is building a **messaging app** and wants to deliver basic features quickly. Which **SDLC model** should they use, and why?
    - **Answer**: **Incremental Model**. It allows for delivering the system in small, functional increments, starting with basic features like texting.
7. **Scenario**: A team is developing a **healthcare app** that needs to comply with strict regulations. Which **SDLC model** should they use, and why?
    - **Answer**: **V-Model**. It ensures rigorous testing and compliance with regulatory standards, which is critical for healthcare systems.

3. Requirements Engineering

1. **Scenario**: A company is developing a **patient information system** for a hospital. What are the **user requirements** and **system requirements** for this system?

- **Answer**:
    - **User Requirements**: "The system shall allow doctors to view patient history."
    - **System Requirements**: "The system shall store patient records in a secure database with AES-256 encryption."

2. **Scenario**: A university wants to develop an **online examination system**. What are the **functional** and **non-functional requirements** for this system?
    - **Answer**:
        - **Functional Requirements**: "The system shall allow students to take exams online."
        - **Non-Functional Requirements**: "The system shall handle 10,000 concurrent users without performance degradation."
3. **Scenario**: A company is developing a **mobile banking app**. What are the **non-functional requirements** for this app?
    - **Answer**:
        - "The app shall use two-factor authentication for login."
        - "The app shall load account balances within 2 seconds."
4. **Scenario**: A team is developing a **video streaming app**. What are the **non-functional requirements** for this app?
    - **Answer**:
        - "The app shall stream videos in 1080p resolution without buffering."
        - "The app shall have 99.99% uptime."
5. **Scenario**: A company is developing a **library management system**. What are the **functional requirements** for this system?
    - **Answer**:
        - "The system shall allow users to search for books by title, author, and ISBN."
        - "The system shall allow librarians to add, update, and remove books."
6. **Scenario**: A team is developing a **ride-sharing app**. What are the **user requirements** for this app?
    - **Answer**:
        - "The app shall allow users to book rides in real-time."
        - "The app shall provide estimated arrival times for drivers."

4. Stakeholder Identification

1. **Scenario**: A company is developing a **public transportation app**. Identify the **stakeholders** for this project.
    - **Answer**: Passengers, transport operators, government authorities, developers, maintenance staff, payment gateways, and advertisers.
2. **Scenario**: A team is developing a **hospital management system**. Identify the **stakeholders** for this project.
    - **Answer**: Patients, doctors, nurses, IT staff, hospital administrators, and insurance companies.
3. **Scenario**: A company is developing a **train protection system**. Identify the **stakeholders** for this project.
    - **Answer**: Train passengers, train drivers, railway safety authorities, and train operating company management.