Assignment I - Semester I (1447 H – 2025))

Subject: Software Engineering (CSC 1301) **Due Date: 03/09/2025 8:00 AM – 9:30 AM**

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Part A: Short Answer

1. Define software engineering in your own words.

Answer:

Software engineering is the systematic process of designing, developing, testing, and maintaining software using engineering principles to ensure it is reliable, efficient, and meets users' needs.

2. Explain why software maintenance costs are usually higher than development costs.

Answer:

Software maintenance costs are higher because:

- Bugs are being fixed and they are being adapted to new environments.
- Software should be updated according to the requirements of users.
- Enhancing performance or adding features takes continuous effort.
- Understanding and modifying existing code is often harder than writing new code.

3. List the essential attributes of good software. Explain briefly why each is important.

Answer:

Maintainability: Can be easily modified and improved in case of requirement change.

Dependability: Reliable and secure, minimizing failures and risks.

Efficiency: Utilizes system resources (CPU, memory) in the most efficient way.

Usability: easy and user friendly to learn and use.

Portability: Able to operate in various hardware or operating systems with very few additions.

4. Compare:

a) Software engineering vs. Computer science

Answer:

Software Engineering: focuses on the practical application of engineering principles to software development, emphasizing design, implementation, testing and maintenance. It is concerned with building software that meets specific requirements.

Computer Science: is a broader field that studies the theoretical foundations of computation, algorithms and data structures. It includes areas such as artificial intelligence, machine learning and network theory which may not directly relate to software development.

b) Software engineering vs. System engineering

Answer:

Software engineering is the particular branch of engineering that deals with coding, testing and software lifecycle management

System engineering is a larger concept and constitutes the design and management of complex systems that can incorporate hardware, software and human elements. It is concerned with how different subsystems are integrated in order to produce the functionalities of the system as a whole

5. Explain the main differences between plan-driven and agile processes. Provide examples of systems where each would be most suitable.

Answer:

Plan-Driven Processes: These processes follow a structured approach with detailed planning, documentation and sequential phases (e.g., Waterfall model). They are suitable for projects with well-defined requirements and low levels of uncertainty.
Example: Large safety-critical systems (e.g., medical devices, banking)

Agile Processes: Agile methodologies emphasize flexibility, iterative development, and collaboration. They allow for rapid adjustments based on user feedback and changing requirements. Agile is most suitable for projects with high uncertainty and evolving needs,
Example: web applications or mobile apps, where quick iterations and responsiveness to user feedback are critical

Part B: Application & Analysis

6. You are asked to build an online food delivery application:

a) Which software process model would you choose and why?

Answer:

I would choose the Agile process model because:

- Requirements may change frequently (new restaurants, features)
- Agile allows incremental delivery so users get usable features quickly
- The constant feedback is used to enhance user experience

b) Identify potential general issues (e.g., heterogeneity, security) that may affect your system.

Answer:

Heterogeneity: Must work on different devices (Android, iOS, web).

Security: Protect user data (addresses, payment info)

Performance: Handle many simultaneous orders without delays

Scalability: Must grow as more restaurants and users join

Reliability: System must be available 24/7 to avoid lost orders

7. From the Insulin Pump case study:

a) Identify at least two key requirements.

Answer:

1. Must monitor blood glucose continuously.
2. Must deliver insulin automatically according to dosage settings.

b) Identify at least two risks.

Answer:

Hardware/Software failure – may cause wrong insulin dose

Incorrect sensor reading – may cause overdose or underdose

Security risk – unauthorized remote access could alter insulin delivery

8. Consider a university student portal system:

Map its development into the four process activities: specification, development, validation, and evolution.

Answer:

Process Activity	**Student Portal**
Specification	Gather requirements: login, course registration, grade viewing fee payment
Development	Design database, build web/mobile interface, implement features
Validation	Test login, course registration flow, ensure data accuracy and usability
Evolution	Add new modules (e.g., internship portal), fix bugs, update UI

9. Select a system type (e.g., e-commerce site):

a) Identify whether it is a generic or customized product.

Answer:

A generic product if it is developed for general sale (e.g., Shopify) but a customized product if built specifically for one company

b) Propose the software process activities for this system (specification, development, validation, evolution).

Answer:

Specification: Identify product catalog, payment gateway, shipping options

Development: Build product pages, shopping cart, payment integration

Validation: Test ordering, payment, delivery tracking

Evolution: Add new features like discount codes, mobile app integration

c) Identify potential software engineering challenges.

Answer:

- Security – Protect payment and user data
- Scalability – Handle peak traffic (sales events)
- Integration – Connect with payment gateways and shipping APIs
- Maintainability – Update product catalog and UI easily