**WEEK ONE ASSIGNMENT: SOFTWARE ENGINEERING**

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**Define Software Engineering:**

Software engineering is a systematic method applied towards the development, process of creating, operation as well as the maintenance of software. It entails the integration of problems solving and systematic approach that goes with engineering in the general software production endeavor with the overall objective of making it safe, fast and easy to maintain.

**Software Engineering vs. Traditional Programming**

Traditional programming involves coding and addressing current issues, software engineering involves the specification of the customers’ requirements, designing, developing, integrating, and testing the software as well as implementing and maintaining software applications.

**Software Development Life Cycle (SDLC)**

The Software Development Life Cycle (SDLC) consists of several phases:

*Requirements Gathering and Analysis*: The response to the need for adaptability and the identification of the constraints of the end-users and of the stakeholders.

*System Design:* The products involved include developing the architectural framework and the system requirements out of the ascertained requisites.

*Implementation*: Coding actual code means, writing programs or developing the software with respect to the design part of the software.

*Testing:* Ensuring that the target software performs in the manner intended by the user, or the specified technical specifications.

*Deployment*: Implementing the software into the field where it is going to be utilized.

*Maintenance:* Making changes and enhancements to the programming code based on alterations in the functionality that is expected, as well as in the correction of errors and enhancement of efficiency.

**Agile vs. Waterfall Models:**

Waterfall Model: implies that the project passes through different stages beginning with the requirements’ stage, the design, the implementation among others, testing, and deployment.

Agile Model: Involves several cycles of marketing of requirements as well as solutions due to flexible cross-functional teams.

**Key differences:**

Waterfall is rigid and the process is followed step by step while Agile is flexible and allows the process to be done in a cycle.

Waterfall is preferred when there are clear and bounded set requirements for the project and when there are high chances of changes in requirements then Agile is used.

**Requirements Engineering:**

Requirements Engineering is the process of obtaining, recording, and stewarding of requirements of a software system. This process puts in place measures that would enable the software product to be able to satisfy the users and the stakeholders. It’s important during the software development track to avoid such changes and satisfy the customer.

**Software Design Principles:**

Modularity in software design means breaking a software system into smaller, manageable pieces or modules. It helps in maintainability by isolating changes and scalability by allowing components to be reused or replaced without affecting the whole system.

**Testing in Software Engineering:**

**Levels of testing:**

*Unit Testing*: Testing individual units or components of the software.

*Integration Testing*: Testing modules together to see they work as expected.

*System Testing:* Testing the whole system against its requirements.

*Acceptance Testing:* Testing to see if the system meets user acceptance criteria.

**Version Control Systems:**

Version Control Systems (VCS) track changes to files over time. They are important in software development for collaboration, tracking history and for teams to work concurrently without conflicts. Examples include Git (with GitHub, GitLab, Bitbucket), SVN (Subversion), Mercurial.

**Software Project Management:**

A software project manager manages the planning, execution and delivery of software projects. Responsibilities include scope management, resource allocation, risk management and stakeholder communication.

Challenges include managing changing requirements, timelines and team dynamics.

**Software Maintenance:**

Software maintenance means modifying and updating software after deployment to fix defects, improve performance, adapt to changes and meet new requirements. Types of maintenance include corrective, adaptive, perfective and preventive maintenance. It’s important as it extends the software’s life and keeps it relevant and effective.

**Ethical Considerations in Software Engineering:**

Software engineers face ethical issues like privacy violations, biased algorithms and intellectual property theft. Adhering to ethical standards means considering the societal impact of their work, being transparent, protecting user data and following professional codes of conduct (e.g., ACM Code of Ethics and Professional Conduct).

**Reference**

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