**Assignment 3: Research and compare SDLC models suitable for engineering projects. Present findings on Waterfall, Agile, Spiral, and V-Model approaches, emphasizing their advantages, disadvantages, and applicability in different engineering contexts.**

**Waterfall Model**

The Waterfall model is a linear and sequential model that follows a strict series of steps inside the software improvement system. It includes five levels: Requirements accumulating and analysis, Design, Implementation, Testing, and Maintenance. Each phase has to be finished earlier than transferring on to the next phase.

* **Advantages:** Simple, linear structure promotes clear planning and documentation. Suitable for well-defined projects with stable requirements.
* **Disadvantages:** Inflexible, changes are difficult to incorporate later stages. Not ideal for projects with evolving requirements or high levels of uncertainty.
* **Applicability:** Good for projects with clear requirements upfront, like building a bridge with established specifications. Less suitable for innovative projects or those involving new technologies.

**Agile Model**

The agile model refers to a software development approach based on iterative development. Agile methods break tasks into smaller iterations, or parts do not directly involve long term planning. The project scope and requirements are laid down at the beginning of the development process.

* **Advantages:** Highly adaptable, allows for continuous feedback and iteration. Empowers teams to respond to changes efficiently.
* **Disadvantages:** Requires strong team communication and collaboration. May lack upfront planning and documentation for complex projects.
* **Applicability:** Excellent for projects with evolving requirements or those involving new technologies. Ideal for rapid prototyping and iterative development. Well-suited for software development but can be adapted for engineering projects with similar characteristics.

**Spiral Model**

The Spiral Model is one of the most important Software Development Life Cycle models. The Spiral Model is a combination of the waterfall model and the iterative model. It provides support for Risk Handling. The Spiral Model was first proposed by Barry Boehm.

* **Advantages:** Combines elements of Waterfall and Agile, allowing for iterative development with risk management at each stage. Suitable for complex projects with high uncertainty.
* **Disadvantages:** Increased complexity compared to Waterfall. Requires skilled project management to balance risk mitigation and progress.
* **Applicability:** Ideal for large, high-risk engineering projects like developing a new aircraft. Useful for projects where requirements may evolve but a structured approach is still needed.

**V-Model**

The V-model is a type of SDLC model where the process executes sequentially in a V-shape. It is also known as the Verification and Validation model. It is based on the association of a testing phase for each corresponding development stage. The development of each step is directly associated with the testing phase. The next phase starts only after completion of the previous phase.

* **Advantages:** Emphasis on verification and validation throughout the lifecycle. Focuses on early defect detection and reduces rework.
* **Disadvantages:** Similar to Waterfall, less flexible for changing requirements. Requires upfront planning and detailed documentation.
* **Applicability:** Useful for safety-critical engineering projects with strict regulations. Good for projects where extensive testing and validation are crucial, like developing medical devices.