Qn : 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.

- Engineering projects require a structured approach to ensure successful development and implementation.

1. Waterfall Model:

- **Advantages:**
    - Structured and well-defined phases, easy to manage for simple projects.
    - Clear documentation at each stage
    - Predictable timeline and budget.
- **Disadvantages:**
    - Potential for errors to propagate through later stages due to upfront planning.
    - Inflexible, difficult to adapt to changing requirements.
    - Not ideal for projects with evolving needs or uncertain requirements.
- **Applicability:**
    - Well-suited for projects with clear requirements, fixed scope, and limited risk of change. (e.g., Building a bridge with pre-defined specifications)

2. Agile Model:

- **Advantages:**
    - Highly adaptable, allows for continuous improvement based on feedback.
    - Encourages close collaboration between development and engineering teams.
    - Faster time to market with working prototypes delivered in iterations.
- **Disadvantages:**
    - Requires a high level of team communication and flexibility.
    - Documentation can be less detailed compared to Waterfall.
    - May not be suitable for projects with strict regulatory requirements.
- **Applicability:**
    - Ideal for projects with evolving requirements, changing priorities, or a high degree of uncertainty. (e.g., Developing a new software application with unknown user needs)

3. Spiral Model:

- **Advantages:**
    - Combines the risk management aspects of Waterfall with the iterative nature of Agile.
    - Explicitly addresses risks at each phase, allowing for course correction.
    - Suitable for large, complex projects with uncertainty.
- **Disadvantages:**
    - Can be more complex to manage than Waterfall or Agile.
    - Requires a strong focus on risk identification and mitigation.
    - May not be ideal for smaller projects with limited resources.
- **Applicability:**
    - Well-suited for high-risk, complex engineering projects where requirements may evolve. (e.g., Developing a new medical device)

4. V-Model:

- **Advantages:**
    - Emphasis on early verification and validation of requirements.
    - Clear mapping between development and testing phases.
    - Suitable for projects with strict quality and regulatory requirements.
- **Disadvantages:**
    - Similar to Waterfall in terms of inflexibility to changing requirements.
    - Requires detailed planning upfront, which may not be feasible for all projects.
    - May be less efficient for projects with a high degree of uncertainty.
- **Applicability:**
    - Ideal for safety-critical systems with well-defined requirements and regulations. (e.g., Developing an aircraft control system)