ALGORITHM DEVELOPMENT

Answer the following questions

1. What is an algorithm?
   - An **algorithm** is a set of procedures used to achieve a given goal. This can be a simple process, such as a cake baking recipe, or a complicated series of operations used in machine learning to evaluate massive datasets and predict outcomes.

2. What are the steps in Algorithm Development?
   - Developing an algorithm can be a difficult process that needs a solid understanding of the problem at hand as well as the available computer resources. Here are the detailed steps, techniques, and technologies that can be used to construct a successful algorithm:
     i. **Identify the problem**. Clearly state the problem you are going to work on. To build an effective algorithm, one must first grasp the complexities and requirements of the task.

     ii. **Analyze the problem**. Dive deep into the problem to acquire all relevant information. Use analytical tools to better understand data structure and patterns.

     iii. **Design the algorithm**. Create a step-by-step procedure to solve the problem. At this stage, you can use flowchart software like Lucidchart or Microsoft Visio to visually map out the algorithm's flow and structure.

     iv. **Select appropriate tools and technologies**. Depending on the complexity of the algorithm, you might need to employ advanced tools and technologies. IDEs like PyCharm or Visual Studio can be useful for coding the algorithm.

v. **Implement the algorithm**. Translate your design into a working algorithm using a programming language suitable for your project. Ensure to follow best coding practices for readability and maintainability.

vi. **Test the algorithm**. Test the implemented algorithm thoroughly using various testing tools such as JUnit for Java and PyTest for Python. Test the algorithm with various inputs to confirm that it consistently produces the correct results.

vii. **Optimize the algorithm**.After testing, evaluate the algorithm's performance and modify it for increased efficiency.

viii. **Document the algorithm**. Document the algorithm comprehensively, explaining each step and its function.

ix. **Deploy the algorithm**. Deploy the algorithm in a real-world environment.

x. **Maintain and update the algorithm**. Post-deployment, maintain the algorithm, updating it as necessary to adapt to changing conditions and requirements.

3. What is the System Development Life Cycle?
   - The **systems development life cycle (SDLC)** is a project management conceptual model that describes the steps of an information system development project, beginning with an evaluation of feasibility and ending with application maintenance.

4. Provide at least examples of the System Development Life Cycle.
   - **Analysis** : The current system is examined. Deficits are identified. This can be accomplished by interviewing system users and speaking with technical support professionals.
   - **Plan and requirements** : New system requirements have been defined. Specifically, shortcomings in the existing system must be addressed with concrete reform ideas.
   - **Design** : The proposed system has been designed. Plans are drawn out for physical construction, hardware, operating systems, programming, communications, and security concerns.

- **Development** : The new components and applications need to be obtained and installed. Users of the system must be taught in its operation.
- **Testing** : Every aspect of performance must be tested. If necessary, changes must be made at this point.
- **Deployment** : The system is implemented in a production environment. This can be accomplished in several ways. The new system can be phased in depending on the application or area, with the old system gradually replaced.
- **Upkeep and maintenance**: This process entails altering and updating the system after it is in place. Continuous upgrades, replacements, or changes to hardware or software may be required to better meet the needs of end users. Users of the system should be kept up to date on the most recent modifications and practices.

5. What are the important role of Flowchart and pseudocode in Software Development?
   - **Flowcharts** are used to visualize the overall structure and flow of an algorithm, while **pseudocode** is used to plan and build algorithms, and code is the actual implementation of an algorithm in a programming language. Flowcharts are simple to read and communicate, but they are not executable.

6. Provide the Definition of the following Java terms
   a. **Class** - A class is a user-defined blueprint or prototype from which objects are created. It represents the collection of properties or methods that apply to all objects of the same type.
   b. **Statement** - The statement identifies a block of statements inside which an exception may be thrown. The catch. A statement must be coupled with a try statement and indicates a block of statements capable of handling a specific sort of exception.
   c. **Method** - A method is a collection of statements that perform a certain action and then return the outcome to the caller. A method can accomplish a certain task without returning anything.
   d. **Exception** - An exception is an event that occurs during the execution of a program and disrupts the normal flow of its instructions. When an error

occurs within a method, the method generates an object and passes it to the runtime system.

e. **Inheritance** - Inheritance is an important component of OOP (Object Oriented Programming). It is the mechanism in Java that allows one class to inherit features (fields and methods) from another.

f. **Object** - An object is the fundamental unit of Object-Oriented Programming that represents real-world entities. A typical Java program generates several objects, which interact by executing methods.

Paste your References (APA format) below

- DataCamp. (2023, September). What is Algorithm? Data Camp. https://www.datacamp.com/blog/what-is-an-algorithm
- Gillis, A. S. (2019, June 21). *systems development life cycle (SDLC)*. Software Quality. https://www.techtarget.com/searchsoftwarequality/definition/systems-development-life-cycle
- GeeksforGeeks. (2024, June 26). *Object Oriented Programming (OOPs) Concept in Java*. GeeksforGeeks. https://www.geeksforgeeks.org/object-oriented-programming-oops-concept-in-java/?ref=shm

Example of reference in APA format

Bohnert, A. (2023, June 27). What Is Java? Inside the World's Leading Programming Language. HackerRank Blog. https://www.hackerrank.com/blog/what-is-java-programming-language-introduction/