Software Development Techniques

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What is the meaning of the following:

1. Meaning of Techniques and Development
2. Types of Software Development Techniques
3. Types of Software Development Methodologies
4. Structured (Structured Programming)
5. Structured (General Meaning)
6. Organisation (Re-organisation)
7. Modernisation
8. Refactoring
9. Re-engineering
10. Forward Engineering
11. Reverse Engineering
12. Architecture
13. Prototype
14. Algorithm
15. Version Control
16. DevOps
17. Model and module (explained)

What is the meaning of:

Techniques

A specific technique or skill used to perform a particular task or activity. It focuses on **how** something is accomplished. For example:

- Debugging techniques تقنيات تصحيح الاخطاء
- Unit testing techniques تقنيات اختبار الوحدات
- Functions testing techniques تقنيات اختبار الدوال
- Restructuring techniques (Code) تقنيات اعادة الهيكلية (للكود)
- Code optimization techniques تقنيات تحسين الكود

Its relationship to software development technologies:

In software development, it defines how software activities, such as design, programming, testing, and maintenance are performed.

Development

A structured framework or system of methods defines what needs to be done, **when** it needs to be done, and **why**. So, it is guide and structure the development process from start to finish. In other words, it is the process of creating, improving, and developing a system over time, and includes rules, phases, roles, and techniques.

Types of Software Development Techniques

1. Programming Techniques

- Structured Programming
- Object-Oriented Programming (OOP)
- Functional Programming

2. Design Techniques

- Modular Design التصميم المعياري
- Top-down Design التصميم من أعلى إلى أسفل

  Starts with the overall system and gradually breaks it down into smaller modules.
- Bottom-up Design التصميم من أسفل إلى أعلى

  Starts by designing small, low-level modules and then integrates them to form larger systems.
- Design Patterns أنماط التصميم
- Layered Architecture العمارة الطبقية

Types of Software Development Techniques

3. Requirements Techniques

- Use Cases
- User Stories قصص المستخدم

It is a brief description of a software feature that explains who wants it, what and why they want it.

- Prototyping النماذج الأولية
- Interviews & Questionnaires المقابلات والاستبيانات

It is a face-to-face discussion between the systems analyst and stakeholders to understand the requirements in depth.

4. Coding & Quality Techniques

- Refactoring إعادة هيكلة الكود
- Code Review مراجعة الكود
- Pair Programming البرمجة الثنائية (two developers work together)
- Clean Code Practices ممارسات كتابة الكود النظيف

Types of Software Development Techniques

5. Testing Techniques

- Unit Testing اختبار الوحدة
- Integration Testing اختبار التكامل
- System Testing اختبار النظام
- Regression Testing اختبار الانحدار

This ensures that features that previously worked correctly will continue to function properly after code changes.

- Test-Driven Development (TDD) (التطوير الموجه بالاختبارTDD)

6. Maintenance & Evolution Techniques

- Reverse Engineering الهندسة العكسية
- Re-engineering إعادة الهندسة
- Software Modernisation تحديث البرمجيات
- Optimization التحسين

Types of Software Development Techniques

7. DevOps & Deployment Techniques

- Continuous Integration (CI)) لتكامل المستمر
- Continuous Deployment (CD)) النشر المستمر

Questions

Is technique belongs to methodology OR methodology belongs to technique?, why or how?

Answer:

- Techniques belong to a Methodology

OR

- Methodology contains techniques, and Techniques make methodology by steps / actions

For example, Techniques is use to cook methodology/method. Like boiling, frying, Grill, Peel, etc.

Types of Software Development Methodologies

1. Traditional Methodologies

- Waterfall
- V-Model
- Spiral
- Incremental Model

2. Agile Methodologies

- Agile
- Scrum
- Extreme Programming (XP)

3. Hybrid Methodologies

- Agile–Waterfall Hybrid

Types of Software Development Methodologies

1. Waterfall

A sequential, linear software development methodology in which each stage must be completed before the next can begin.

Requirements → Design → Implementation → Testing → Deployment → Maintenance

2. V-Model

An extension of the Waterfall methodology, it focuses on testing at every stage of development.

Requirements ↔ Acceptance Testing

System Design ↔ System Testing

Architecture Design ↔ Integration Testing

Module Design ↔ Unit Testing

3. Spiral

Focus on risk assessment and iterative development to allow suitable changes for large and complex systems

Planning → Risk Analysis → Engineering → Evaluation → Next Spiral

Types of Software Development Methodologies

4. Incremental Model

A methodology in which the system is built and delivered in small, usable phases.So, each increment adds functionality and flexible to changes

5. Agile

An iterative and flexible methodology that focuses on collaboration with clients, adaptability, and working software.

- Fast delivery of effective programs
- Flexibility in meeting changing requirements
- Encouraging collaboration and communication among team members
- High customer satisfaction

Read and Discuss with your Group, What is the meaning of following:

1. Structured (General Meaning)

Organized in a clear, logical, and precisely defined manner.

Its relationship to software development techniques:

Structured methodologies improve clarity, control, and quality in software development techniques.

2. Organisation (Re-organisation)

Reorganizing or rearranging software components, modules, or system architecture.

Its relationship to software development techniques:

Is a design and structural technique that improves system scalability and maintainability.

3. Modernisation

Updating software to utilise modern technologies, platforms, and tools.

Its relationship to software development techniques:

Is an advanced software development technique that extends the lifespan of existing systems.

Read and Discuss with your Group, What is the meaning of following:

4. Refactoring

Improving the internal structure of a program without altering its external behaviour.

Its relationship to software development techniques:

Is a software-level development technique used to improve quality during development or maintenance.

5. Re-engineering

The process of analysing and improving an existing software system to enhance quality, performance, and ease of maintenance.

Its relationship to software development techniques:

Is an advanced software development technique focused on long-term system improvement.

6. Forward Engineering

The process of building or rebuilding software systems based on design specifications.

Its relationship to software development techniques:

This process represents the constructive phase of software development techniques.

Read and Discuss with your Group, What is the meaning of following:

7. Reverse Engineering

Analysing existing software to understand its design, structure, and behaviour.

Its relationship to software development techniques:

It supports software development techniques by recovering lost system knowledge.

8. Architecture

The overall structure of a software system, including its components and their interactions.

Its relationship to software development techniques:

Software architecture forms the foundation for all software development techniques.

9. Prototype

A preliminary or simplified version of a program used to explore ideas or clarify requirements.

Its relationship to software development techniques:

Is a technique for defining requirements and designing software.

Read and Discuss with your Group, What is the meaning of following:

10. Structured (Structured Programming)

A programming approach that uses sequencing, selection, and repetition to create clear and logical programs.

Its relationship to software development techniques:

It is a fundamental approach in software development for writing easily readable and maintainable code.

11. Version Control

A system for tracking and managing changes to source code over time.

Its relationship to software development techniques:

Is a development-supportive approach that enables collaboration and tracking.

12. DevOps

A set of practices that integrate software development and IT operations.

Its relationship to software development techniques:

Is a modern software development technology focused on automation and continuous delivery.

Term	Meaning	Relationship with Software Development Techniques
Techniques	Systematic methods or approaches used to perform tasks efficiently	Define how software activities (design, coding, testing) are carried out
Development	The process of creating, improving, and evolving a system	Software development techniques guide and control this process
Structured (Structured Programming)	Programming using sequence, selection, and iteration	A fundamental programming technique for writing clear and maintainable code
Structured (General)	Organized in a clear, logical, and well-defined way	Structured approaches improve quality and reliability of development techniques
Organisation (Re-organisation)	Arrangement or rearrangement of software components or modules	A design and architectural technique to improve maintainability and scalability
Modernisation	Updating software with modern technologies and platforms	An advanced development technique that extends software life
Refactoring	Improving internal code structure without changing behavior	A code-level software development technique for quality improvement
Re-engineering	Analyzing and improving an existing system to enhance quality	A high-level development technique for system evolution
Forward Engineering	Building software from design specifications	Represents the construction phase of development techniques
Reverse Engineering	Analyzing existing software to understand its design	Supports development techniques by recovering system knowledge
Architecture	High-level structure of a software system	Forms the foundation of design techniques in software development
Prototype	Early or simplified version of software	A requirements and design technique to clarify user needs
Version Control	System for tracking and managing code changes	A supporting development technique enabling collaboration
DevOps	Practices integrating development and operations	A modern development technique enabling automation and CI/CD