* 1. **Software Quality Assurance** (**SQA) :**

 Quality Assurance consists of the auditing and reporting functions of management. The goal of quality assurance is to provide management with the data necessary to be informed about product quality, thereby gaining insight and confidence that product quality is meeting its goals.

***Software quality assurance goal is to achieve high-quality software product.******Quality refers to measurable characteristics of software. These items can be compared based on a given standard***

Three import points for quality measurement:

1. Use requirements as the foundation
2. Use specified standards as the criteria
3. Considering implicit requirements

SQA encompasses:

(1) Quality management approach

(2) Effective software engineering technology

(3) Formal technical reviews

(4) multi-tiered testing strategy

(5) document change control

(6) Software development standard and its control procedure

(7) Measurement and reporting mechanism.

* 1. **Quality Control**

 The series of inspections, reviews, and test used throughout the develop cycle of a software product Quality control includes a feedback loop to the process. Quality control compares the work products with the specified and measurable standard. The objective of quality control is to minimize the produced defects, increase the product quality.

Implementation approaches:

* Fully automated
* Entirely manual
* Combination of automated tools and human interactions.

**7.2.1 Types of quality control**:

1. Quality design: In software development, quality of design encompasses requirements, specifications, and the design of the system.
2. Quality of conformance: is an issue focused primarily on implementation. If the implementation follows the design and the resulting system meets its requirements and performance goals, conformance quality is high.

**7.3 Element of Software Quality Assurance**

 Software quality assurance encompasses a broad range of concerns and activities that focus on the management of software quality.

* Standards.
* Reviews and audits.
* Testing
* Error/defect collection and analysis
* Change management.
* Education.
* Security management.
* Risk management

**7.4 Cost of Quality**

 The cost of quality includes all costs incurred in the pursuit of quality or in performing quality-related activities. Cost of quality studies are conducted to provide a baseline for the current cost of quality, identify opportunities for reducing the cost of quality, and provide a normalized basis of comparison. The basis of normalization is almost always dollars.

Quality cost includes:

1- Prevention cost: quality planning, formal technical reviews, testing equipment, training.

2- Appraisal cost: in-process and inter-process inspection, equipment calibration and maintenance, testing

3- Failure cost: internal failure cost, rework, repair, and failure mode.

4-external failure cost: complaint resolution, product return and replacement, help line support, warranty work

As expected, the relative costs to find and repair a defect increase dramatically as we go from prevention to detection to internal failure to external failure costs.

**7.5 SQA Activities**

 The Software Engineering Institute recommends a set of SQA activities that address quality assurance planning, oversight, record keeping, analysis, and reporting. These activities are performed (or facilitated) by an independent SQA group that:

1- Prepares SQA plan for a project.

2- Participates in the development of the project’s software process description.

3- Reviews software engineering activities to verify compliance with the defined software process.

4- Audits designated software work products to verify compliance with those defined as part of the software process.

5- Ensures that deviations in software work and work products are documented and handled according to a documented procedure.

6- Records any noncompliance and reports to senior management. Noncompliance items are tracked until they are resolved.