**Subject Area Exam – Quality Management**

1. What are three dimensions of software quality?

Answer (Section 19.2):

* An effective software process establishes the infrastructure that supports any effort at building a high quality software product.
* A useful productdelivers the content, functions, and features that the end-user desires, but as important, it delivers these assets in a reliable, error free way.
* Byadding value for both the producer and user of a software product, high quality software provides benefits for the software organization and the end-user community.

1. Describe the costs associated with software quality work?

Answer (Section 19.3.2):

* *Prevention costs* - quality planning, formal technical reviews, test equipment, training
* *Appraisal co*sts - in-process and inter-process inspection, equipment calibration and maintenance, testing
* *Internal failure costs* - rework, repair, failure mode analysis
* *External failure cos*ts - complaint resolution, product return and replacement, help line support, warranty work

1. What practices should software engineers follow to enhance the quality of software produced by their team?

Answer (Section 19.4):

* Software quality is the result of good project management and solid engineering practice
* To build high quality software you must understand the problem to be solved and be capable of creating a quality design the conforms to the problem requirements
* Eliminating architectural flaws during design can improve quality

4. What are the goals for any product review?

Answer (Section 20.1):

* Point out needed improvements in the product of a single person or team
* Confirm those parts of a product in which improvement is either not desired or not needed
* Achieve technical work of more uniform, or at least more predictable, quality than can be achieved without reviews, in order to make technical work more manageable

5. What effect do software reviews have on software production costs?

Answer (Section 20.1):

* Industry studies suggest that design activities introduce 50-65% of all defects or errors during the software process
* Review techniques have been shown to be up to 75% effective in uncovering design flaws which ultimately reduces the cost of subsequent activities in the software process

6. What are the differences between a review summary report and a review issues list?

Answer (Section 20.6.2):

Review Summary Report

* What was reviewed?
* Who reviewed it?
* What were the findings and conclusions?

Review Issues List

* Identifies problem areas within product
* Serves as action list to guide the work product creator as corrections are made before it occurs or the rapid detection of a quality problem if one is introduced.

7. List the tasks performed by the SQA group.

Answer (Section 21.4.1):

* Prepare SQA plan for the project.
* Participate in the development of the project's software process description.
* Review software engineering activities to verify compliance with the defined software process.
* Audit designated software work products to verify compliance with those defined as part of the software process.
* Ensure that any deviations in software or work products are documented and handled according to a documented procedure.
* Record any evidence of noncompliance and reports them to management

8. What are the goals for the project SQA activities?

Answer (Section 21.4.2):

* Requirements quality
* Design quality
* Code quality
* Quality control effectiveness

9. What is meant by the term software reliability?

Answer (Section 21.7):

Software reliability is the probability of error free operation of a computer program in a specified environment for a specified time period.

10. What are the unique characteristics of cleanroom software engineering techniques?

Answer (Section 28.1):

* Make extensive use of statistical quality control
* Verify design specification using mathematically-based correctness proofs
* Rely heavily on statistical use testing to uncover high impact errors

11. List the steps required for certification in cleanroom software engineering.

Answer (Section 28.4.2):

* Usage scenarios are created
* A usage profile is specified
* Test cases are generated from the usage profile
* Tests are executed, failure data is recorded and analyzed
* Reliability is computed and recorded

12. What are the advantages of using a formal language to write a software specification?

Answer (Section 28.6):

The formal syntax of a specification language enables requirements or design to be interpreted in only one way, eliminating ambiguity that often occurs when a natural language (e.g., English) or a graphical notation (e.g., UML) must be interpreted by a reader. The descriptive facilities of set theory and logic notation enable a clear statement of requirements. To be consistent, requirements stated in one place in a specification should not be contradicted in another place.

13. List the 3 broad categories of information that make up the software configuration.

Answer (Section 29.1):

Computer programs (source code and executables), documentation (technical and user), data (internal and external to programs)

14. What is a software configuration audit?

Answer (Section 29.3.5):

Once a change has been made to a software configuration item and an FTR has been conducted, the software quality team conducts its own review to ensure that software process and standards have been followed (including updating all affected documents and any other affected software configuration items).

15. What is content management?

Answer (Section 29.4.3):

Content management establishes a process that acquires existing content, structures it to be presented to an end-user, and provides for display, to the client-side environment.

16. List three characteristics of a good software metric.

Answer (Section 30.1.5):

Simple and computable, empirically and intuitively persuasive, consistent use of units and dimensions, programming language independent, provides effective mechanism for quality feedback

17. Component-level design metrics focus on what three internal characteristics of software

components?

Answer (Section 30.3.6):

Module cohesion, coupling, and complexity

18. Technical testing metrics fall into two major categories. What are they?

Answer (Section 30.6):

Metrics that focus on test coverage and metrics that focus on the duration of the testing process.

19. What are the elements of a software process (SPI) framework?

Answer (Section 37.1.1):

* Set of characteristics that must be present if an effective software process is to be achieved
* Method for assessing whether those characteristics are present
* Mechanism for summarizing the results of any assessment
* Strategy for assisting a software organization in implementing those process characteristics that have been found to be weak or missing

20. What activities make up the roadmap activities for software process improvement?

Answer (Section 37.2):

* Assessment and gap analysis
* Education and training
* Selection and justification
* Installation/migration
* Evaluation

21. What benefits and costs are used to compute return-on-investment (ROI)?

Answer (Section 37.6):

* *benefits* include cost savings associated with higher product quality, less rework, reduced effort associated with changes, and the income that accrues from shorter time-to-market.
* *costs* include both direct SPI costs and indirect costs associated with greater emphasis on quality control and change management activities