

ORDRE DES INGÉNIEURS DU QUÉBEC

MAY 2014 SESSION

Open-book examination

Calculators: only authorized models

Duration: 2,5 hours

/85 points

04-LOG-A5 Software Quality Assurance

Question 1: Explain the difference between **quality assurance** and **quality control**. Associate the right concept with its description (4 points):

- 1) Quality Control
- 2) None of the two
- 3) Quality Assurance
- 4) Both

- a) The verification process of their own work or that of a colleague: ____
- b) The preparation of a specification document: ____
- c) A set of planned and systematic activities of all actions necessary to provide adequate confidence that a product item complies with the established set of technical requirements: ____
- d) Conducting the acceptance test with an end user : ____

Question 2: 30 errors have been found, during an inspection, in a 100 pages document. We know that our defect detection efficiency is 85% and that we inject 5% of new errors by doing these corrections. Calculate the number of errors that remain in the document once we are done with this inspection. Explain your calculations (5 points):

Question 3) Every **business model** has a set of attributes or factors that are specific to it. Do you know the meaning of each situational factor? For each statement (b1 to b7), choose **only one** of the seven (7) most influencing attributes for the situation described (7 points):

- 1) many target environments
- 2) the cost of correcting errors
- 3) the uncertainty of the needs and requirements of users
- 4) communications
- 5) regulation
- 6) criticality
- 7) the size of the project

- 3.1. The requirements of a new consumer product is so new that the end users do not even know what they want: ____
- 3.2. Software sold in the mass market should operate on a wide range of environments: ____
- 3.3. The potential to injure or kill a user: ____
- 3.4. The distribution of fixes in an embedded software is much more expensive than fixing a website: ____
- 3.5. In some industries, it is necessary to use certain practices that would not otherwise be necessary. In addition it must be shown that we are using them correctly: ____
- 3.6. Projects that span more than a year and have a large number of developers versus a project that will have a duration of a few months with a small team: ____
- 3.7. Development tasks are separated and given to different organizations and sometimes in several different countries: ____

Question 4: Explain the concept of **integrity level** of a software as used by software engineers and presented in IEEE 1012 (10 points)

- a) **True or False:** According to the IEEE 1012 standard, the integrity level required by a software influences the V&V tasks to be accomplished? (1 point): _____.
- b) **True or False:** According to the IEEE 1012 standard, the integrity of a software can be assessed as a range of values that reflects its complexity, risk, security level, performance and reliability characterizing the importance of this software for the user? (1 point): _____.
- c) How many software integrity levels is there? (2 points): ____ d) Describe briefly the meaning of each level (6points) :

[illegible]

Question 5: List each of the 5 types of **software review** as described by the IEEE 1028 standard. For each type of review, specify the following information: (10 points)

Review type	Objective	Management present?	Checklist	Main output

Question 6: The importance of **traceability** in software quality assurance (10 points)

6.1. **True or False:** Traceability is the establishment of a link between two or more work products?: ____

6.2. **True or False:** Changes made to existing requirements have no impact on the Traceability Matrix? (1 point) : ____

6.3. Describe in what **industry** and **business domain** this matrix is often a requirement?

6.4. List 5 reasons? (8 points)

[illegible]

Question 7: Paul had planned that his project would cost him 35 person/day (p/d) for the development of requirements, 50 p/d for the detailed design, 10 p/d of reviews, 100 p/d for programming, 10 p/d to measure, 45p/d to test, 45 p/d to implement and manage its configuration management and 10 p/d so that the team members familiarize themselves with the new agile methodology. His project, once finished, had a final cost of 310 p/d, because of the many rework activities he had to do during the project (10 points):

7.1. Calculate each of the cost of quality perspectives:

Cost (p/d) :

- rework :
- performance (delivery) :
- prevention :
- appraisal :

7.2. Calculate the percentage of each quality perspective in the project (2 points) :

- rework :
- performance (delivery) :
- prevention :
- appraisal :

Question 8: Ethics of the software engineer. (5 points)

8.1. **True or False:** Software engineers shall protect the public interest as the primary goal and the most important goal of their code of ethics? (1 point): _____

8.2. **True or False:** The Code of Ethics is an algorithm that generates ethical decisions? (1 point) : _____

8.3 Circle **only one answer** (3 points): The Software Engineer Code of Ethics aims at?

- a. Documenting moral and professional commitments of software engineers.
- b. Forcing individuals to meet quality standards.
- c. Document good practices in software engineering.

Question 9: The right **SQA terminology**: defect, fault or failure. (3 points)

9.1. The execution of a fault is (1 point): _____.

9.2. If it is not corrected, it may produce a failure (1 point): _____.

9.3. Circle **only one** answer (1 point): A defect is?

- a. failure
- b. a fault
- c. A human action that produces an incorrect result
- d. All of the above
- e. None of the above

Question 10: As a practical matter, **risk management** is divided into two main stages. Can you identify them both? (Circle **only two** answers) (2 points) :

- a. The risk assessment.
- b. Risk control.
- c. Risk identification.
- d. The risk analysis.
- e. Prioritization of risks.

Question 11: Rank each of the eight software **supplier management practices** (from 1 to 8) (as described by the CMMI) in logical order as they should be used for a new software acquisition project from start to finish. (8 points):

- Transfer, to the project, software products acquired from the supplier: ____
- In the case of a custom software supplier, select and evaluate intermediate work products: ____
- Ensure that the contract, with the software supplier, is satisfactory before final acceptance of the acquired software: ____
- Select, monitor and analyze the software processes used by the supplier: ____
- Conduct SQA activities, with the help of the supplier, as specified in the contract: ____
- Establish and maintain formal supplier agreements: ____
- Choose software suppliers based on an assessment of their capabilities to fulfill requirements and established criteria: ____
- Determine the software acquisition type for each product or product component to be acquired: ____

Question 12: Rank (from 1 to 7) the seven recommended steps for implementing a **software measurement program**. (7 points):

- Determine the goals and objectives related to key processes: ____
- Describe the information systems to put in place: ____
- Involve staff in the measurement process: ____
- Demonstrate the relevance of software measurement to senior management: ____
- Establish a software measurement program: ____
- Build the software measurement program: ____
- Identify key processes to improve: ____

Question 13: Why documenting software process? (3 points)

13.1. **True or False:** Documenting processes and procedures promotes continuous improvement but it is not clear how or why this happens? ____

13.2. **True or False:** Documenting processes and procedures capture the knowledge of individuals? ____

13.3. **True or False:** Documenting processes and procedures result in defect reduction? ____

Question 14: The importance of a good configuration management software. (5 points):

14.1. **True or False:** A Configuration Management library can be used by a project. It is a repository used by a team of developers. Transactions on this repository are controlled? (1 point) ____

14.2. Which of these functions are functions of a configuration management library?

(multiple answers allowed - only circle the correct answers) (1 point)

- a. Restoration of archived configuration items.
- b. Sharing of configuration items.
- c. Production of configuration management reports.
- d. Preparation of configuration management plans.
- e. The defect management associated with elements of a configuration.

14.3. **True or False:** Creation of new branches is a strategy to reduce the costs associated with configuration management? (1 point) ____

14.4. **True or False:** A typical CM branching strategy is one that allows branches to deliver to each customer a customized version? (1 point) ____

14.5 **True or False:** A typical CM branching strategy is based on the assumption that the production branch is independent of the branch used for the development of new features? (1 point) ____