
**THE
RELIABILITY ENGINEER
SOLUTIONS TEXT**

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SECTION II

RELIABILITY MANAGEMENT -- TEST QUESTIONS

2.1. Which of the following is required to establish a reliability specification?

- a. The usage environment
- b. The system quality
- c. The reliability policy
- d. A reliability model

Solution: One of the key components of a reliability specification is the usage environment. When other factors are included in the specification a reliability model can be projected. System quality (answer **b**) and reliability policy (answer **c**) are out of sync with the wording of the question.

Answer a is correct.

Reference: *CRE Primer*, Section II - 7 and 35/36.

2.2. An excellent tool to slightly refine one or more variables in order to determine the range of expected values is:

- a. Decision tree analysis
- b. Sensitivity analysis
- c. Expected monetary value
- d. Modeling simulation

Solution: Decision tree analysis is the general method to analyze a problem with several fixed variables and probabilities. The expected monetary value method is similar to decision tree analysis but adds the component of the expected value of money, associated with each branch path. Modeling simulation will use a specific mathematical model for analysis. Sensitivity analysis is the correct choice since it will vary, slightly, one or more of its variables in order to see the effects on the range of possibilities.

Answer b is correct.

Reference: *CRE Primer*, Section II - 69/71.

2.3. Reliability organizations:

- a. Must be independent of the quality organization
- b. Should maintain a balance between building core competency and deliverables
- c. Must provide only technical support functions
- d. Should develop dependable products and permit customers to make choices from these options

Solution: Organizational, strategic, and tactical issues are integrated in this question.

Answer **a** is incorrect. Reliability organizations need not be independent of quality organizations to be successful, provided that adequate focus is directed to reliability oriented tasks. Answer **c** is incorrect. Reliability organizations must provide both steering inputs in the decision making process as well as perform technical support tasks. Answer **d** is somewhat restrictive, often products are developed in collaboration with customers. The continued success of a reliability organization will only be possible if the skills required to support the program are cultivated while current project needs are addressed.

Answer b is correct.

Reference: *CRE Primer*, Section II - 2/4 and 8/15.

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2.4. Which of the following is NOT a risk analysis method?

- a. Worst-first
- b. What-if
- c. Delphi
- d. HAZOP

Solution: Note that a negative response is requested. This question requires knowledge of risk assessment methods. Answer **a** is a fabricated response. The other choices are risk assessment methods. HAZOP stands for hazard and operational study.

Answer a is the correct, incorrect, choice.

Reference: *CRE Primer*, Section II - 120.

2.5. Product liability is considered which of the following?

- a. The responsibility to reduce hazards and risks in manufactured products
- b. The responsibility to make good on any loss or damage caused as a result of a transaction
- c. The responsibility of the manufacturer to provide warning labels to the user
- d. The responsibility of a manufacturer to recall product after a lawsuit

Solution: This is a basic definition question. Answer **d** is a rather narrow responsibility and is an incorrect selection. Answers **a** and **c** are parts of product risk management.

Answer b is correct.

Reference: *CRE Primer*, Section II - 28/30 and 94.

2.6. The reliability engineer's ultimate goal in most organizations may be best expressed as:

- a. The reduction of warranty returns and improvement of test yields
- b. The minimization of product failure rate during the constant failure rate period
- c. The analysis and optimization of full life cycle phases
- d. The identification and elimination of all failure modes

Solution: A "big picture" perspective is highlighted by this question. The key phrase is "best expressed."

The "analysis and optimization of full life cycle cost impact" best captures and conveys the ultimate objective of the complexities associated with the activities and tasks carried out by the reliability engineer. Answer **d** is always difficult to achieve. Elements of answers **a**, **b**, and **d** could be looked upon as subsets of answer **c**.

Answer c is correct.

Reference: *CRE Primer*, Section II - 72/75 and 88/89.

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- 2.7. One would say that product safety is largely:
- A result of product quality, reliability, and management direction
 - A composite outcome of tight vendor and supplier control
 - An outcome of good product design and low component costs
 - The result of design reviews, FMEAs, and FRACAS analysis

Solution: This question is stated at a general level. Answers **b**, **c**, and **d** tend to be directed mainly at reliability and quality concerns. Answer **a** considers the larger impact of reliability, quality, and management action.

Answer a is correct

Reference: *CRE Primer*, Section II - 3/5.

- 2.8. "The probability that the system is either available at the beginning of the mission or can be brought to an operationally ready state by the beginning of the mission" is the definition of:
- Design adequacy
 - Systems effectiveness
 - Operational readiness
 - Mission reliability

Solution: This is basically a definition question.

The easiest and fastest method to find this answer is by using logical deduction. The question provides the answer. Isn't "operationally ready" the same as "operational readiness"? Another method to obtain the answer is checking the definitions of each answer in the *RAM Dictionary*. Most of these are provided in the *CRE Primer* as well. Design adequacy is the probability that the system will satisfy its effectiveness requirements. System Effectiveness is the probability that a system can successfully meet an operational demand within a given time period and when operating under specified conditions. Mission reliability is the probability that an item will perform its required functions, in the mode for which it was designed, and for the duration of a specified mission profile.

Answer c is correct.

References: *CRE Primer*, Section II - 53. Omdahl, T.P., *Reliability, Availability, and Maintainability (RAM) Dictionary*. 1980 published CRE exam, question 81 (modified).

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- 2.9. Product safety regulations include:
- Product requirement laws passed by governments
 - Requirements for general, equipment, and component safety
 - Performance requirements for products
 - Evaluation requirements for product safety testing

Solution: This question tests the understanding of the differences between standards, regulations, and directives. Answers **b**, **c**, and **d** correctly identify characteristics of standards. Answer **a** indicates that a regulation is in effect.

Answer a is correct

Reference: *CRE Primer*, Section II - 101/102.

- 2.10. Using the DMAIC approach to lean six sigma improvement, at what step would the root causes of defects be identified?
- Measure
 - Control
 - Improve
 - Analyze

Solution: This is a straight forward question that requires some understanding of the DMAIC approach. The root causes of defects are identified during the analyze phase.

Answer d is correct.

Reference: *CRE Primer*, Section II - 17.

- 2.11. Which of the following is a risk assessment method?
- Severity annunciation
 - Delphi techniques
 - TRAP techniques
 - User focus reviews

Solution: This question requires knowledge of risk assessment methods. There are no formal assessment methods called severity annunciation and user focus reviews. The TRAP technique is a distracter choice that uses the letters in PRAT (product reliability acceptance testing). The Delphi technique anonymously surveys experts to acquire their opinions.

Answer b is correct.

References: *CRE Primer*, Section II - 120/121.
