Certified Reliability Engineer

1. Reliability Management (18 Questions)

A. Strategic Management
i. Benefits of reliability engineering
ii. Interrelationship of safety, quality, and reliability
iii. Role of the reliability function in the organization
iv. Reliability in product and process development
v. Failure consequence and liability management
vi. Warranty management
vii. Customer needs assessment
viii. Supplier reliability

B. Reliability Program Management
i. Terminology
ii. Elements of a reliability program
iii. Types of risk
iv. Product lifecycle engineering
v. Design evaluation
vi. Systems engineering and integration

C. Ethics, Safety, and Liability
i. Ethical issues
ii. Roles and responsibilities
iii. System safety

2. Probability and Statistics for Reliability (27 Questions)

A. Basic Concepts
i. Statistical terms
ii. Basic probability concepts
iii. Discrete and continuous probability distributions
iv. Poisson process models
v. Non-parametric statistical methods
vi. Sample size determination
vii. Statistical process control (SPC) and process capability

B. Statistical Inference
i. Point estimates of parameters
ii. Statistical interval estimates
iii. Hypothesis testing (parametric and non-parametric)

3. Reliability in Design and Development (26 Questions)

A. Reliability Design Techniques
i. Environmental and use factors
ii. Stress-strength analysis
iii. FMEA and FMECA
iv. Common mode failure analysis
v. Fault tree analysis (FTA) and success tree analysis (STA)
vi. Tolerance and worst-case analyses
vii. Tolerance and worst-case analyses
viii. Fault tolerance
ix. Reliability optimization
x. Human factors
xi. Design for X (DFX)
xii. Reliability apportionment (allocation) techniques

B. Parts and Systems Management
i. Selection, standardization, and reuse
ii. Derating methods and principles
iii. Parts obsolescence management
iv. Establishing specifications

4. Reliability Modeling and Predictions (22 Questions)

A. Reliability Modeling
  i. Sources and uses of reliability data
  ii. Reliability block diagrams and models
  iii. Physics of failure models
  iv. Simulation techniques
  v. Dynamic reliability

B. Reliability Predictions
  i. Part count predictions and part stress analysis
  ii. Reliability prediction methods

5. Reliability Testing (24 Questions)

A. Reliability Test Planning
  i. Reliability test strategies
  ii. Test environment

B. Testing During Development
  i. Accelerated life tests
  ii. Discovery testing
  iii. Reliability growth testing
  iv. Software testing

C. Product Testing
  i. Qualification/demonstration testing
  ii. Product reliability acceptance testing
  iii. Ongoing reliability testing

  iv. Stress screening
  v. Attribute testing
  vi. Degradation (wear–to-failure) testing

6. Maintainability and Availability (15 Questions)

A. Management Strategies
  i. Planning
  ii. Maintenance strategies
  iii. Availability tradeoffs

B. Maintenance and Testing Analysis
  i. Preventive maintenance (PM) analysis
  ii. Corrective maintenance analysis
  iii. Non-destructive evaluation
  iv. Testability
  v. Spare parts analysis

7. Data Collection and Use (18 Questions)

A. Data Collection
  i. Types of data
  ii. Collection methods
  iii. Data management

B. Data Use
  i. Data summary and reporting
  ii. Preventive and corrective action
  iii. Measures of effectiveness

C. Failure Analysis and Correction
  i. Failure analysis methods
  ii. Failure reporting, analysis, and corrective action system (FRACAS)

Levels of Cognition
Based on Bloom's Taxonomy—Revised (2001)
In addition to content specifics, the subtext for each topic in this BOK also indicates the intended complexity level of the test questions for that topic. These levels are based on "Levels of Cognition" (from Bloom's Taxonomy—Revised, 2001) and are presented below in rank order, from least complex to most complex.

Remember Recall or recognize terms, definitions, facts, ideas, materials, patterns, sequences, methods, principles, etc. **Understand** Read and understand descriptions, communications, reports, tables, diagrams, directions, regulations, etc. **Apply** Know when and how to use ideas, procedures, methods, formulas, principles, theories, etc	**Analyze** Break down information into its constituent parts and recognize their relationship to one another and how they are organized; identify sublevel factors or salient data from a complex scenario. **Evaluate** Make judgments about the value of proposed ideas, solutions, etc., by comparing the proposal to specific criteria or standards **Create** Put parts or elements together in such a way as to reveal a pattern or structure not clearly there before; identify which data or information from a complex set is appropriate to examine further or from which supported conclusions can be drawn.

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