

## **CERTIFIED QUALITY PROCESS ANALYST – BODY OF KNOWLEDGE**

Included in this body of knowledge (BOK) are explanations (subtext) and cognitive levels for each topic or subtopic in the test. These details will be used by the Examination Development Committee as guidelines for writing test questions and are designed to help candidates prepare for the exam by identifying specific content within each topic that can be tested. Except where specified, the subtext is not intended to limit the subject or be all-inclusive of what might be covered in an exam but is intended to clarify how topics are related to the role of the Certified Quality Process Analyst (CQPA). The descriptor in parentheses at the end of each subtext entry refers to the highest cognitive level at which the topic will be tested. A more complete description of cognitive levels is provided at the end of this document.

### **I. Quality Basics [24 questions]**

#### **A. ASQ code of ethics**

Identify appropriate behaviors for situations requiring ethical decisions. (Apply)

#### **B. Quality planning**

Define a quality plan, understand its purpose for the organization as a whole and who in the organization contributes to its development. (Understand)

#### **C. Cost of quality (COQ)**

Describe and distinguish the classic COQ categories (prevention, appraisal, internal failure, external failure) and apply COQ concepts. (Apply)

#### **D. Quality standards, requirements, and specifications**

Define and distinguish between quality standards, requirements, and specifications. (Understand)

#### **E. Documentation systems**

Identify and describe common elements and different types of documentation systems such as configuration management, quality manual, document control, etc. (Understand)

#### **F. Audits**

##### **1. Audit types**

Define and describe various audit types: internal, external, system, product, and process. (Understand)

##### **2. Audit process**

Describe various elements, including audit preparation, performance, record keeping, and closure. (Understand)

[NOTE: Corrective action is covered in IV.F.]

##### **3. Roles and responsibilities**

Identify and define roles and responsibilities of audit participants (lead auditor, audit team member, client, and auditee). (Understand)

## **G. Teams**

### **1. Types of teams**

Distinguish between various types of teams such as process improvement, work group, self-managed, temporary/ad hoc, cellular, etc. (Analyze)

### **2. Team-building techniques**

Define basic steps in team-building such as introductory meeting for team members to share information about themselves, the use of ice-breaker activities to enhance team membership, the need for developing a common vision and agreement on team objectives, etc. (Apply)

### **3. Roles and responsibilities**

Explain the various team roles and responsibilities, such as sponsor, champion, facilitator, team leader, and team member, and responsibilities with regard to various group dynamics, such as recognizing hidden agendas, handling distractions and disruptive behavior, keeping on task, etc. (Understand)

## **H. Training components**

Define and describe methods that can be used to train individuals on new or improved procedures and processes, and use various tools to measure the effectiveness of that training, such as feedback from training sessions, end-of-course test results, on-the-job behavior or performance changes, department or area performance improvements, etc. (Understand)

# **II. Problem Solving and Improvement [23 questions]**

## **A. Basic quality tools**

Select, apply, and interpret these tools: flow charts, Pareto charts, cause and effect diagrams, check sheets, scatter diagrams, and histograms. (Analyze)

[NOTE: The application of control charts is covered in section III.E.]

## **B. Continuous improvement models**

Define and explain elements of Plan-Do-Check-Act (PDCA), kaizen, and incremental and breakthrough improvement. (Apply)

## **C. Basic quality management tools**

Select and apply affinity diagrams, tree diagrams, process decision program charts, matrix diagrams, interrelationship digraphs, prioritization matrices, and activity network diagrams. (Apply)

## **D. Project management tools**

Select and interpret scheduling and monitoring tools such as Gantt charts, program evaluation and review technique (PERT), critical path method (CPM), etc. (Analyze)

## **E. Taguchi loss function**

Identify and describe Taguchi concepts and techniques such as signal-to-noise ratio, controllable and uncontrollable factors, and robustness. (Understand)

**F. Lean**

Identify and apply lean tools and processes, including set-up reduction (SUR), pull (including just-in-time (JIT) and kanban), 5S, continuous flow manufacturing (CFM), value stream, poka-yoke, and total preventive/predictive maintenance (TPM) to reduce waste in areas of cost, inventory, labor, and distance. (Apply)

**G. Benchmarking**

Define and describe this technique and how it can be used to support best practices. (Understand)

**III. Data Analysis [35 questions]**

**A. Terms and definitions**

**1. Basic statistics**

Define, compute, and interpret mean, median, mode, standard deviation, range, and variance. (Apply)

**2. Basic distributions**

Define and explain frequency distributions (normal, binomial, Poisson, and Weibull) and the characteristics of skewed and bimodal distributions. (Understand)

**3. Probability**

Describe and apply basic terms and concepts (independence, mutual exclusivity, etc.) and perform basic probability calculations. (Apply)

**4. Measurement scales**

Define and apply nominal, ordinal, interval, and ratio measurement scales. (Apply)

**B. Data types and collection methods**

**1. Types of data**

Identify, define, and classify continuous (variables) data and discrete (attributes) data, and identify when it is appropriate to convert attributes data to variables measures. (Apply)

**2. Methods for collecting data**

Define and apply methods for collecting data such as using data coding, automatic gaging, etc. (Apply)

**C. Sampling**

**1. Characteristics**

Identify and define sampling characteristics such as lot size, sample size, acceptance number, operating characteristic (OC) curve, etc. (Understand)

**2. Sampling methods**

Define and distinguish between various sampling methods such as random, sequential, stratified, fixed sampling, attributes and variables sampling, etc. (Understand)

[NOTE: Reading sampling tables is not required.]

**D. Measurement terms**

Define and distinguish between accuracy, precision, repeatability, reproducibility, bias, and linearity. (Understand)

**E. Statistical process control (SPC)**

**1. Techniques and applications**

Select appropriate control charts for monitoring or analyzing various processes and explain their construction and use. (Apply)

**2. Control limits and specification limits**

Identify and describe different uses of control limits and specification limits. (Understand)

**3. Variables charts**

Identify, select, construct, and interpret  $\bar{X} - R$  and  $\bar{X} - s$  charts. (Analyze)

**4. Attributes charts**

Identify, select, construct, and interpret p, np, c, and u charts. (Analyze)

**5. Rational subgroups**

Define and describe the principles of rational subgroups. (Understand)

**6. Process capability measures**

Define the prerequisites for measuring capability, and calculate and interpret  $C_p$ ,  $C_{pk}$ ,  $P_p$ , and  $P_{pk}$  in various situations. (Analyze)

**7. PRE-control chart**

Define the concept and use of PRE-control charts. (Understand)

**8. Common and special cause variation**

Interpret various control chart patterns (runs, hugging, and trends) to determine process control, and use rules to distinguish between common cause and special cause variation. (Analyze)

**9. Data plotting**

Identify the advantages and limitations of analyzing data visually instead of numerically. (Understand)

**F. Regression and correlation**

Describe how regression and correlation models are used for estimation and prediction. (Apply)

**G. Hypothesis testing**

Determine and calculate confidence intervals using t tests and the z statistic, and determine whether the result is significant. (Analyze)

[NOTE: The F test is covered in area III.I.]

**H. Design of experiments (DOE)**

Define basic terms such as blocking, randomization, etc. (Remember)

**I. Analysis of variance (ANOVA)**

Define and determine the applicability of ANOVAs. (Understand)

**IV. Customer-Supplier Relations [18 questions]**

**A. Internal and external customers and suppliers**

Define and distinguish between internal and external customers and suppliers and their impact on products and services, and identify strategies for working with them to improve products, services, and processes. (Apply)

**B. Customer satisfaction analysis**

Describe the different types of tools used to gather and analyze customer feedback: surveys, complaint forms, warranty analysis, quality function deployment (QFD), etc. (Understand)

**C. Product/process approval systems**

Identify and describe how validation and qualification methods (alpha/beta testing, first-article, etc.) are used in new or revised products, processes, and services. (Understand)

**D. Reliability**

Define basic concepts such as mean time to failure (MTTF), mean time between failures (MTBF), mean time between maintenance actions (MTBMA), and mean time to repair (MTTR), and identify failure models such as bathtub curve, prediction, growth, etc. (Remember)

**E. Supplier management**

Define and describe key measures of supplier performance (quality, price, delivery, level of service, etc.) and commonly used metrics (defect rates, functional performance, timeliness, responsiveness, technical support, etc.). (Understand)

**F. Elements of corrective and preventive action**

Identify elements of the corrective action process including containment, problem identification, root cause analysis, correction, recurrence prevention, verification and validation of effectiveness, and concepts of preventive action. (Analyze)

**G. Material identification, status, and traceability**

Describe methodologies used for material identification and conformance status. Apply various methods of identifying and segregating nonconforming materials, and describe the requirements for preserving the identity of a product and its origin. (Apply)

[NOTE: Product recall procedures will not be included.]

## **LEVELS OF COGNITION BASED ON BLOOM’S TAXONOMY (REVISED)**

In addition to *content* specifics, the subtext detail also indicates the intended *complexity level* of the test questions for that topic. These levels are based on the Revised “Levels of Cognition” (from Bloom’s Taxonomy, 2001) and are presented below in rank order, from least complex to most complex.

### **REMEMBER**

(Also commonly referred to as recognition, recall, or rote knowledge.) Be able to remember or recognize terminology, definitions, facts, ideas, materials, patterns, sequences, methodologies, principles, etc.

### **UNDERSTAND**

Be able to read and understand descriptions, communications, reports, tables, diagrams, directions, regulations, etc.

### **APPLY**

Be able to apply ideas, procedures, methods, formulas, principles, theories, etc., in job-related situations.

### **ANALYZE**

Be able to break down information into its constituent parts and recognize the parts’ relationship to one another and how they are organized; identify sublevel factors or salient data from a complex scenario.

### **EVALUATE**

Be able to make judgments regarding the value of proposed ideas, solutions, methodologies, etc., by using appropriate criteria or standards to estimate accuracy, effectiveness, economic benefits, etc.

### **CREATE**

Be able to put parts or elements together in such a way as to show a pattern or structure not clearly there before; able to identify which data or information from a complex set is appropriate to examine further or from which supported conclusions can be drawn.