

ESE-2022 Prelims Paper-I

Standards and Quality Practices IN PRODUCTION, CONSTRUCTION, MAINTENANCE AND SERVICES



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PREFACE

In today's time, minimum assured quality of products and services has become bare essential for private as well as government sectors. It is for this reason that students aspiring for Engineering Services Examination (ESE) should have a well-structured view of the standards and quality practices in production, construction, maintenance and services.

This book helps students build upon concepts from the scratch to the advanced level. From evolution of concept of quality to various thinkers and approaches, to statistical tools and accepted sampling parameters as well as six sigma standards have been discussed thoroughly. It further delves into inventory management, and touches upon various aspects of manufacturing vis-à-vis quality, maintenance and reliability.

Being an engineer is about quality assurance in whatever products and services one designs and delivers, as per established standards. Therefore, it is given foremost importance by the UPSC.

This revised and updated edition builds on all the important variables that have been cited in previous versions of Engineering Services Examination.

As one go through various topics, concepts, and illustrations, an augmented sketch of all the important issues touching standards and quality is drawn. This makes sure that whatever spin is given to the questions, one can deduce the correct answer.

Any constructive ideas, suggestions, feedbacks for improving the content of future editions will be highly appreciated.

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Basic Concepts of Quality

1.1 KEY CONCEPTS RELATED TO QUALITY

INSIDE

- ❖ Key Concepts Related to Quality
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- ❖ Cost of Quality
- ❖ Value of Quality
- ❖ Evolution of Concept of Quality
- ❖ Quality Policy
- ❖ Quality Objectives
- ❖ Quality Assurance and Quality Control
- ❖ Quality Audit
- ❖ Quality Management
- ❖ Quality Improvement
- ❖ Quality and Productivity

- ❖ Quality depends on the degree of fitness for use by the customer. Hence, a product will have good quality if it is suitable for the purpose for which it is meant. However, the term, fitness for purpose, is a highly subjective term, the interpretation of which may vary from individual to individual. The criterion of fitness for purpose is perfectly suitable at only one stage of production of a product or service. This is the stage of designing the product. The marketing department of the company prepares a product definition document in which it specifies the expectations and requirements of the customer from the product. This document is passed on to the design department where the designs of the product are prepared keeping in mind the fitness for purpose i.e. the expectations of the customer. The designs so prepared are rated good or bad according to the extent to which these are able to satisfy the requirements mentioned in the product definition document. In all the subsequent stages such as development, engineering, production, distribution and after-sales service, quality is measured in terms of conformance to specifications. During the development of the product, various specifications are evolved. These specifications have to be adhered to in all the stages of production in order to achieve the desired quality of the product. Conformance to these specification can be verified by the objective evidence in contrast to the subjective approach of the fitness for purpose criterion.
- ❖ Quality of a product means the conformance to specification. The customer's needs have to be assessed and translated into specifications.
- ❖ The product or service must meet the customer's expectations or needs. The needs can be both stated as well as implied.
- ❖ The product or service should be cost effective or economical. Due to increased competition, the companies have to continuously improve their products' function and reduce wastages to reduce cost.
- ❖ Reliability is an important indicator of quality over a period of time. It means that the product must perform its intended function over a period of time without failing under given operating conditions.
- ❖ The product should be serviceable. It means that the after-sales service of the product should be quick, cheap and easily available. In the face

of intense competition today, an important dimension of quality which was overlooked so far by many Indian companies is customer service. In India, the domestic industry can overcome the threat of foreign MNCs by focussing on this aspect of quality. Manufacturing organisations must focus on after-sales service as an important opportunity for making a difference in quality to gain competitive advantage.

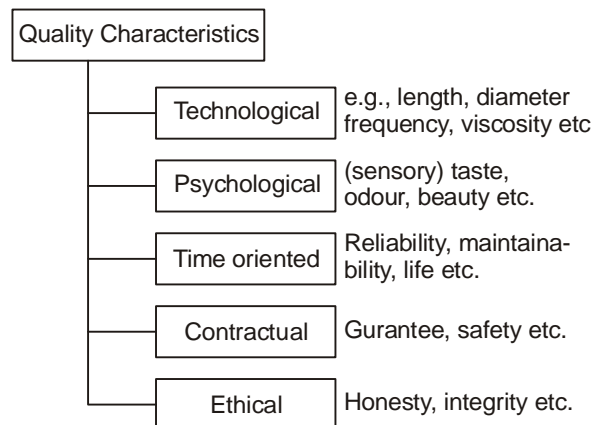
- ❖ The product should be durable. Durability means the effective life of the product after which it can no longer be used even after repair.
- ❖ The product or service should have good perceived quality.
- ❖ The product must also have good aesthetics and it should be safe in handling.
- ❖ Quality is a relative term. It is not absolute. It varies with time, space and from person to person.
- ❖ Stiff competition at the national and international level and customer's awareness about the quality of goods and services have made it necessary that companies put increased emphasis in achieving the desired customer satisfaction by running its business at an economical level.
- ❖ Feigenbaum defines quality as : The total composite product and service characteristics of Engineering, Manufacturing, Marketing and Maintenance through which the product and service in use meet the expectations of the customers. Efforts should be made to incorporate the quality at the design stage and maintained in manufacturing which the customer would like to have and is willing to pay for it.
- ❖ The product must perform its intended function repeatedly as called upon, over its stipulated life cycle under normal conditions of use. It should be easy to operate or use.
- ❖ The survival of the company depends on the income it gets from selling its products and services, and the ability to sell is based on fitness for use. Hence, the company's functions concerned with quality or achieving fitness for use are known as quality functions. It includes variety of activities. Every one working in the factory or all departments are responsible for the broad quality function. With the aid of market survey, a company determines what qualities are needed by the customers.
- ❖ Research and development specialists create a product concept which can meet these quality needs of the users. Design engineers prepare product and material specifications considering the quality requirements. Process engineers specify the processes, machines and instruments capable of producing the products with the desired quality, and inspecting them. Purchasing specialists buy materials and components possessing appropriate qualities. Operators are trained to use the process and instruments to make the product as per the design. Inspectors examine the product to judge conformance with the design. Consumers use the product and the experience of use becomes the basis for a redesign, or improvement in the product, which starts the cycle all over again.
- ❖ Quality is a perceptual, conditional, and somewhat subjective attribute and may be understood differently by different people. The perception of quality of a product or service from the point of view of a customer may be different from that of the producer. The problem of the producer is aggravated by the fact that the number of customers may be too large and each one may have a different perception about quality. Consumers may focus on the specific quality of a product/service, or how it compares to competitors in the marketplace. Producers might measure the conformance quality, or degree to which the product/service was produced correctly. Support personnel may measure quality in the degree that a product is reliable, maintainable, or sustainable. If a third party such as a quality certification agency has to decide about the quality of the product or service, its perception may be different from those of the customer and the producer.
- ❖ In the early 1900s, pioneers such as Frederick Taylor and Henry Ford recognized the limitations of the methods being used in mass production at the time and the subsequent varying quality of output, implementing quality control, inspection, and standardization procedures in their work. Later in the twentieth century, the likes of Deming and Juran helped take quality to new heights, initially in Japan and later (in the late '70s and early '80s) globally.
- ❖ Customers recognize that quality is an important attribute in products and services, and suppliers recognize that quality can be an important differentiator between their own offerings and those

of competitors (the quality gap). In the past two decades this quality gap has been gradually decreasing between competitive products and services. This is partly due to the contracting (also called outsourcing) of manufacturing to countries like China and India, as well as internationalization of trade and competition. These countries, among many others, have raised their own standards of quality in order to meet international standards and customer demands. The ISO 9000 series of standards are probably the best known international standards for quality management, though specialized standards such as ISO 15189 (for medical laboratories) and ISO 14001 (for environmental management) also exist.

- ❖ The introduction of the ISO standards sought to provide organizations with the requirements to create a quality management system (QMS) for a range of different business activities. Additionally, good manufacturing practice standards became more common place in countries around the world, laying out the minimum requirements. Manufacturers in industries including food and beverages, cosmetics, pharmaceutical products dietary supplements, and medical devices must meet to assure their products are consistently high in quality. Process improvement philosophies such as Six Sigma have further pushed quality to the forefront of business management and operations. At the heart of these and other efforts is often the QMS, a documented collection of processes, management models, business strategies, human capital, and information technology used to plan, develop, deploy, evaluate, and improve a set of models, methods, and tools across an organization for the purpose of improving quality that aligns with the organization's strategic goals.
- ❖ Quality certification bodies such as ISO conduct quality audits by third party that is externally trained and authorised quality auditors of the quality system before certifying an organisation. It is a requirement of ISO 9000 that an organisation seeking ISO certification has to conduct internal quality audits on a regular basis. These audits, also called first party audits, can be conducted by the trained employees of the organisation to ensure that the quality system is maintained properly.

- ❖ The push to integrate the concept of quality into the functions of the service industry takes a slightly different path from manufacturing. Where manufacturers focus on tangible and visible issues, many quality aspects of the service provider's output are intangible. Other obstacles include management's perceptions not aligning with customer's expectations due to lack of communication and market research and the improper skills of the service personnel. Like manufacturing, customer expectations are key in the service industry, though the degree with which the service interacts with the customer definitely shapes perceived service quality. Perceptions such as being dependable, responsive, understanding, competent, and clean may drive service quality, somewhat in contrast to factors that drive measurement of manufacturing quality.
- ❖ A physical or chemical property, a dimension, a temperature, pressure, taste, smell or any other requirements used to define the nature of the product or service which contributes to fitness for use is a quality characteristic. Thus, a metal cylinder may be defined by stating the quality characteristics such as, the type of metal, the length, the diameter etc. The quality characteristic contributes to fitness for use for the product.

Quality characteristics can be classified as :



Example 1

Statement (I) : Quality is essential for survival and growth of an organisation in the present era of tough competition.

Statement (II) : The concept of quality is confined only to construction and manufacturing organisations.

[ESE-2018]

Ans: (c)