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Preface

Preface to Second Edition

Standards & Quality Practices has been written mainly to cater for students appearing for union public service commission, ESE (Engineering Services Examination). It covers in detail the syllabi for this examination. Questions typical of those set in the examinations have been included to practice and to discover the extent of one's knowledge. Keywords are printed in bold type to assist the student further in assimilating the information.

In writing this book we have had in mind the needs and interests of students appearing for these competitive examinations, since most of the text books already available are written too extensively making most of it irrelevant to the demands of the examination. The boxed information focus on points of topical interest or on particular concept.

IES Master wishes to take this opportunity of thanking **IES Master Team** for his extensive contribution in generating, shaping, editing and production of this book. We also thank the staff at IES Master and all those who have assisted with information and advice in the production of this book.

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OBJECTIVE QUESTIONS

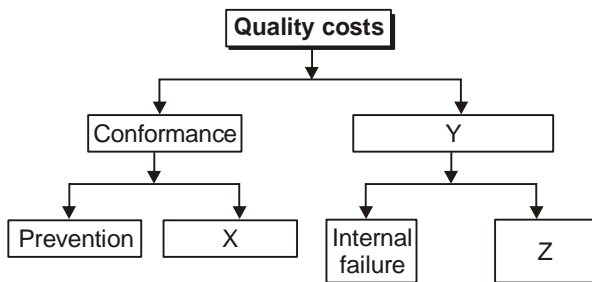
1. Premises on which “total quality system” was proposed by quality gurus like Edwards Deming, Joseph M. Juran and Armand V. Feigenbaum in early 1950s were.
 - (i) Quality in a product exists only when a customer finds that product satisfactory in its use.
 - (ii) A quality product in addition to meeting the needs of the customer, should also be produced at minimal cost.
 - (iii) A product had quality if it met the specifications selected by the manufacturer’s designers, which might have been chosen with or without reference to the needs of the customer.
 - (iv) All the units involved in production of a quality item must contribute towards to create a product that will satisfy the customer both in terms of performance and cost.
 - (a) (i), (ii) and (iii) (b) (ii) and (iii) only
 - (c) (i), (ii) and (iv) (d) (iii) and (iv) only
2. Read the following statements and state the correct option
 - (i) Though propounded by western quality gurus, industries in Japan were first to champion the concept of Total Quality System.
 - (ii) Concept of total quality system did not gain traction in US until better quality Japanese products gained sizeable market in US.
 - (a) Both (i) and (ii) are false.
 - (b) (i) is true and (ii) is false.
 - (c) (i) is false and (ii) is true.
 - (d) Both (i) and (ii) are true.
3. Quality circles which evolved in Japan consisted of
 - (a) Line workers and line foreman who were trained in statistical methods of quality control.
 - (b) Senior executive of industries to form sector specific quality standards.
 - (c) Academicians and Practitioners in the field of quality to evolve new quality control methods.
 - (d) None of the above.
4. Which of the following statements correctly define “Quality”?
 - (i) Meeting customers, both internal and external, expectation.
 - (ii) Degree of excellence at an acceptable price and control of variability at an acceptable cost.
 - (iii) Fitness for use or purpose.
 - (iv) Meeting product specifications within specified tolerances.
 - (a) Only (i), (ii) & (iii) (b) Only (i) and (iii)
 - (c) Only (ii) and (iv) (d) All of above
5. Read the following statements and select the correct option.
 - (i) Quality of design enables achievement of required product features and characteristics.
 - (ii) Quality of conformance enables achievement of freedom from deficiencies.
 - (a) Only (ii) is true.
 - (b) Both (i) and ii) are false.
 - (c) Both (i) and (ii) are true.
 - (d) Only (i) is true.
6. In reference to the approaches identified by Garvin for defining quality, match the following:

1. Transcendent Approach	(i) Quality is a precise and measurable variable.
2. Product- based Approach	(ii) Quality is synonymous with innate excellence and is universally recognizable.
3. User based Approach	(iii) Quality is assured by incorporating customer’s views during product design and is reflected in consumer demand curves.
4. Manufacturing based Approach	(iv) Quality is defined in terms of cost and prices.
5. Value based approach.	(v) Quality is defined as conformance to specifications.

- (a) 1-(ii), 2-(iii), 3-i, 4-v) & 5-(iv).
 (b) 1-(ii), 2-(i), 3-(iii), 4-v) & 5-(iv).
 (c) 1-(iii), 2-(i), 3-(iv), 4-(ii) & 5-(iv)
 (d) 1-(i), 2-(ii), 3-(iii), 4-(iv) & 5-v).
7. While designing a radically new product which approach will be best suited to define its quality:
 (a) Transcendent approach.
 (b) Manufacturing based approach.
 (c) User based approach.
 (d) Value based approach.
8. Which among the following is not a main component of Quality Management?
 (a) Quality Control.
 (b) Quality assurance.
 (c) Total Quality Cost.
 (d) Quality improvement.
9. In reference with type of quality, match the following.
- | | |
|----------------------------|---|
| 1. Indifferent quality | (i) Quality that customer expects but if found lacking, it does not necessarily result in loss of order or a displeased customer. |
| 2. Expected quality | (ii) Quality that customer does not notice or appreciate. |
| 3. One dimensional quality | (iii) Quality that customer expects and demands. |
| 4. Exciting quality | (iv) Quality that exceeds customer expectations, attracting favourable attention. |
- (a) 1-(i), 2-(ii), 3-(iii) & 4-(iv).
 (b) 1-(ii), 2-(iii), 3-(i) & 4-(iv).
 (c) 1-(iii), 2-(i), 3-(ii) & 4-(iv).
 (d) 1-(iv, 2-(ii), 3-(iii) & 4-(i)
10. In reference with paradigm of quality, match the following:
- | | |
|---|--|
| 1. Customer Craft Paradigm | (i) Focus is on production rate with no direct involvement of the customer. |
| 2. Mass-product Paradigm | (ii) Products are tailored made as desired by the Customers. |
| 3. Statistical Quality Control Paradigm | (iii) Statistical tools are used for process control. |
| 4. Total Quality Management Paradigm | (iv) Focus on creating custom created products with lower lead time by using high level of mechanisation. |
| 5. Techno- Craft Paradigm | (v) key tenets are: Employee involvement and empowerment, customer focus, continuous improvement, top management commitment etc. |
- (a) 1-(i), 2-(ii), 3-(iii), 4-(iv) & 5-(v).
 (b) 1-(v), 2-(i), 3-(iii), 4-(ii) & 5-(iv)
 (c) 1-(ii), 2-(i), 3-(iii), 4-(v) & 5-(iv)
 (d) 1-(ii), 2-(iv), 3-(iii), 4-(i) & 5-(v)
11. In reference to Total quality cost (TQC) which of the following statements are correct:
 (i) TQC consist of "Cost of conformance" and "Cost of non-conformance"
 (ii) Cost of conformance implies expenses required for producing quality product.
 (iii) Cost of non-conformance is loss because of defects in the product.
 (a) Only (i) and (ii) are correct.
 (b) (i), (ii) and (iii) are correct.
 (c) Only (i) is correct.
 (d) Only (i) and (iii) is correct.
12. Which one of the following is/are correctly matched.
 (i) Cost of Conformance – Prevention Cost.
 (ii) Cost of non-conformance – Appraisal Cost
 (iii) Cost of Conformance – Cost of internal failure
 (iv) Cost of non-conformance – Cost of external failure

- (a) Only (i) and (ii) are correct.
- (b) Only (iii) and (iv) are correct.
- (c) Only (i) is correct.
- (d) Only (i) and (iii) are correct.

13. Please select the appropriate option for filling the blanks in the following Quality Cost diagram.



- (a) x-Appraisal cost, y- non-conformance, z- cost of retesting.
- (b) x- cost of non conformance, y- Appraisal cost, z- external failure cost.
- (c) x- cost of process control, y- cost of auditing, z- cost of scrap.
- (d) x- cost of product inspection, y- warranty claims, z- cost of repair.

14. Cost of which among the following will be included in cost of Prevention

- (i) Cost of quality planning.
- (ii) Cost of training of workers to make quality products.
- (iii) Cost of information collection and analysis about number and types of defects.
- (iv) Cost of retest after rectification of a product

- (a) Only (i) (ii) and (iii)
- (b) Only (i) (iii) (iv)
- (c) Only (iii) and (iv)
- (d) Only (ii) and (iv)

15. Any cost arising out of claim of customer regarding a defective product within its guarantee period should be included in

- (a) Appraisal Cost.
- (b) Cost of internal failure
- (c) Cost of external failure
- (d) Prevention cost

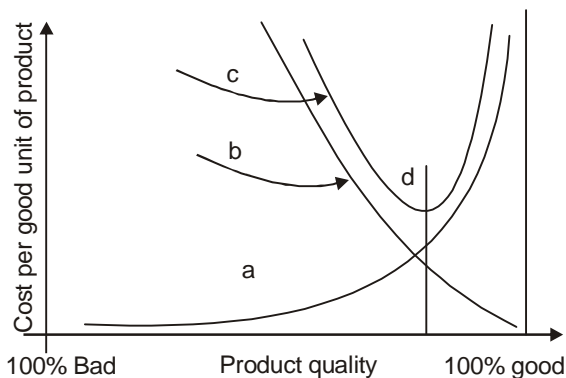
16. Which of the following will be considered a failure quality cost?

- (a) Salaries of personnel testing repaired products.
- (b) Cost of test equipment.
- (c) Cost of training workers to achieve production standards.
- (d) Incoming inspection to prevent defective parts coming into stores

17. Read the following statements and answer the question

- (i) Total Quality Cost cannot be reduced to Zero.
- (ii) Prevention cost and appraisal cost will always be positive.
- (a) Both i and (ii) are correct and (ii) is correct explanation of (i)
- (b) Both (i) and (ii) are correct but (ii) is not the correct explanation of (i)
- (c) Only (i) is correct and (ii) is incorrect.
- (d) (i) is incorrect and (ii) is correct.

18. Study the following graph between cost of quality & level of quality and answer which of the following option is true.



- (a) a- Prevention cost + Appraisal cost.
- (b) b- Prevention cost + cost of internal failure.
- (c) c- Cost of external failure + Appraisal Cost.
- (d) d- Most expensive quality level.

19. Of the following statements, which is true in the context of relationships among quality cost categories?

- (a) When prevention cost is increased, appraisal cost may increase.
- (b) When appraisal cost is increased, prevention cost may increase.

ANSWERS

1. (c)	9. (b)	17. (a)	25. (c)	33. (c)
2. (d)	10. (c)	18. (a)	26. (a)	34. (d)
3. (a)	11. (b)	19. (d)	27. (c)	35. (c)
4. (d)	12. (c)	20. (b)	28. (c)	
5. (c)	13. (a)	21. (b)	29. (a)	
6. (b)	14. (a)	22. (c)	30. (d)	
7. (a)	15. (c)	23. (a)	31. (d)	
8. (c)	16. (a)	24. (d)	32. (c)	

EXPLANATION

1. **(a)** Concept of Total Quality System was proposed in contrast of the earlier of quality that “a product had quality if it met the specifications selected by the manufacturer’s designers, which might have been chosen with or without referring to the needs of the customers”. Statement i, ii and iv are the correct premises on which TQS was proposed.
2. **(d)** Contribution of western quality gurus like Edwards Deming, Joseph M. Juran and Armand V. Feigenbaum lead to the evolution of the concept of Total quality system which Japanese quickly embraced and called it “Total quality control” or “companywide quality control” and it was after Japanese manufacturers acquired sizeable share of automobile and consumer electronics market that American companies started paying real attention to quality.
3. **(a)** Concept of quality circles (QC) evolved in Japan in 1962 when the Union of Japanese Scientists and Engineers (JUSE) under the leadership of Dr. Kauro Ishikawa began training workers and foremen in statistical methods through a new journal called Quality Control for Foreman which carried lessons in statistical quality control. These groups of workmen and foremen were called Quality Circles where they learned to use statistical methods to solve quality related problems of their own processes. The success of QC circles is considered to be one of the most important factors in Japanese successes in quality.
4. **(d)** All above statements are definitions of quality given by different quality gurus.
5. **(c)** Both statements are true as quality in design ensures that product features required by the customer are incorporated in product’s design and expressed as product specifications. Quality of conformance ensures that there is no gap between actual product features and designed specifications.
6. **(b)** As per Garvin, five major approaches to define quality are:
 1. The Transcendent Approach: In this view, “quality” is synonymous with ‘innate excellence and is absolute and universally recognizable.
 2. The Product-based approach: In this approach, quality is a precise and measurable variable which is composite of all the attributes that describe the degree of excellence of a product.
 3. The User-based approach: This is an approach to assure that the customer’s voice

is incorporated during product design and is reflected in consumer demand curve.

4. The Manufacturing-based Approach: Under this approach, quality is defined as conformance to specifications; reduce cost by reducing the number of deviations with a focus on engineering and manufacturing practices.
 5. The Value-based approach: Under this, quality is defined as performance or conformance at an acceptable cost i.e. quality is defined in terms of costs and prices.
7. (a) Product of radical innovation enters a market that may not exist and where customers may not be able to articulate their need. Hence there may not be ready made customers' requirements that can be incorporated in product design as specifications.
 8. (c) The three main components of Quality management are Quality Control, Quality Assurance and Quality improvement.
 9. (b) Types of quality are:
 1. Indifferent Quality: Quality that the customer does not notice or appreciate for e.g paint thickness over a car.
 2. Expected quality: Quality that customer expects and demands for e.g. Cooling performance of an Air – Conditioner.
 3. One- dimensional quality: Quality that the customer expects but that does not necessarily result in loss of the order or a displeased customer when found lacking in the product. For e.g. life of tyres in a car.
 4. Exciting quality: Quality that exceeds customer expectations attracting favourable attention. For e.g. effectiveness of voice based assistants (like Siri, Cortona) in smart phones.
 10. (c)
 - **Customer Craft Paradigm:** In this, product is created or services are rendered exactly in the manner desired by the customer. For example Coffee Shops, furniture shop, tailor's shop etc.
 - **Mass-product Paradigm:** This paradigm developed post mechanisation. Here focus is on production rate with no direct involvement of customer although the product is defined keeping the customer in mind. For example Automobile Part

manufacturing, readymade buildings for commercial enterprises etc.

- **Statistical Quality Control Paradigm:** This is similar to the mass production paradigm except that the emphasis here is more on the process. Applied together with mechanized production, the statistical process control results in low scrap and rework and low cost of production. For example Automobile parts manufacturing, electronic component manufacturing etc.
 - **Total Quality Management Paradigm:** The focus here is on the customer and the supplier. Employee involvement and empowerment, customer-focus, continuous improvement, top management commitment, training, teamwork are its key tenets. The result is a high quality product, low cost, fast delivery and substantially reduced opportunities for rework and low generation of scrap. Examples of this pattern are found in product/services produced by TQM companies.
 - **Techno-Craft Paradigm:** This paradigm is a new frontier of quality that seeks to employ the custom-craft paradigm in performance while reducing delivery time. This paradigm requires a high level of product process flexibility, which enables the customers to get exactly what they desire. The requirement here is to integrate machine, men and automation. Computer aided design and manufacturing is of great use here. Each unit is designed and built on the basis of customer requirements. Examples of this pattern are found in the software and apparel industries.
11. (b) Cost of conformance is the price paid for prevention of poor quality (to avoid failure in product or services) and cost of non-conformance which is the of losses incurred due to failure of product or service because of poor quality. Thus, TQC will depend on how much an organisation is spending to prevent poor quality and how much cost it is incurring because of failures due to poor quality. Mathematically,

$$\text{TQC} = \text{Cost of Conformance (COC)} + \text{Cost of non Conformance (CONC)}.$$
 12. (c) Cost of conformance includes Prevention cost and Appraisal cost while Cost of non-

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