GUJARAT TECHNOLOGICAL UNIVERSITY

BE-7 SEMESTER – OLD PAPER – S22 TO S26 – QUESTION BANK

Subject Name & Code: Quality and Reliability Engineering - 3171929

Chapter 1: Introduction to Quality

Repeated Questions:

1. Definitions and Dimensions of Quality:

- **Q.** Explain any three dimensions of Quality. **(SUMMER 2023, 3 Marks; WINTER 2023, 4 Marks)**
- **Q.** Give various definitions of Quality. **(WINTER 2022, 4 Marks; SUMMER 2025, 4 Marks)**
- **Q.** Define: (1) Quality (2) TQM (3) Poka yoke. **(WINTER 2022, 3 Marks; WINTER 2025, 3 Marks)**

2. Quality Gurus:

- **Q.** List/Name five Quality Gurus and explain the contribution of any two. **(WINTER 2022, 4 Marks; SUMMER 2023, 4 Marks)**
- **Q.** How Juran, Deming and Crosby define Quality? **(WINTER 2023, 3 Marks; SUMMER 2026, 3 Marks – "Define Quality as per view of Dr. Juran and Dr. Philip Crosby.")**

3. Inspection, Quality Control and Quality as a Strategy:

- **Q.** Differentiate between Inspection and Quality Control. **(SUMMER 2023, 7 Marks; WINTER 2024, 3 Marks)**
- **Q.** Justify "Quality as a winning strategy" / "Quality products make a significant impact on revenues". **(SUMMER 2022, 3 Marks; WINTER 2024, 4 Marks)**

Other Important Questions:

1. Quality Control and Quality Assurance:

- **Q.** Differentiate between Quality Control and Quality Assurance. **(SUMMER 2022, 4 Marks)**
- **Q.** Enlist the various phases of Quality Revolution and discuss inspection, quality control and quality assurance. **(SUMMER 2025, 7 Marks OR)**
- **Q.** State objectives of quality control. **(WINTER 2025, 3 Marks)**
- **Q.** Write short notes on Total quality control. **(SUMMER 2026, 7 Marks)**

2. TQM:

- **Q.** What do you mean by TQM? Also discuss principles of TQM. **(WINTER 2024, 7 Marks)**

Chapter 2: Quality Management Concepts and Tools

Repeated Questions:

1. Quality Circle, 5S and Kaizen:

- **Q.** Define and explain Quality Circle. / Explain the process of operation of quality circle. / Explain Quality Circle with its advantages. **(WINTER 2022, 3 Marks; SUMMER 2023, 3 Marks; WINTER 2024, 3 Marks; SUMMER 2026, 3 Marks)**
- **Q.** Explain the concept of 5S. **(SUMMER 2022, 7 Marks – part c; WINTER 2022, 4 Marks; SUMMER 2023, 4 Marks; SUMMER 2025, 3 Marks; WINTER 2025, 4 Marks; SUMMER 2026, 4 Marks – "Explain 5's Principle in context to your institute workshop.")**
- **Q.** Describe the concept of Kaizen. **(WINTER 2022, 3 Marks; WINTER 2024, 4 Marks; SUMMER 2025, 3 Marks)**

2. Poka-Yoke and PDCA:

- **Q.** Explain Poka-Yoke with two examples. **(SUMMER 2022, 3 Marks; SUMMER 2023, 3 Marks)**
- **Q.** Explain the PDCA cycle. **(WINTER 2022, 4 Marks; SUMMER 2023, 4 Marks; WINTER 2024, 7 Marks OR; WINTER 2025, 4 Marks)**

3. QFD, FMEA and Fault Tree Analysis:

- **Q.** Define QFD and Discuss the House of Quality (Product Planning Matrix). [Diagram required – refer to the original question paper] **(WINTER 2022, 7 Marks; SUMMER 2023, 7 Marks; WINTER 2023, 7 Marks; SUMMER 2025, 7 Marks; WINTER 2025, 7 Marks; SUMMER 2026, 4 Marks – "Describe Quality function Deployment with a neat sketch.")**
- **Q.** What is FMEA? Explain how it helps in ensuring quality. / Draw its format. **(SUMMER 2022, 7 Marks OR; WINTER 2022, 7 Marks OR; SUMMER 2023, 7 Marks OR; WINTER 2023, 7 Marks; SUMMER 2026, 7 Marks – "Elaborate FMEA with suitable examples.")**
- **Q.** Explain Fault tree analysis [FTA]. **(WINTER 2025, 4 Marks; SUMMER 2026, 3 Marks – "Elaborate Fault tree analysis- FTA")**

4. Quality Control Tools:

- **Q.** Discuss the basic 7 Quality Control Tools. **(WINTER 2022, 7 Marks; SUMMER 2023, 7 Marks; SUMMER 2026, 7 Marks – "Explain 7 Quality control tools with its advantages.")**
- **Q.** List out and explain the 7 new management/quality improvement tools. **(SUMMER 2023, 7 Marks OR; WINTER 2024, 7 Marks; WINTER 2025, 3 Marks; WINTER 2025, 7 Marks – "List out 7 new management tools and explain any five in detail.")**

5. TQM Implementation:

- **Q.** Discuss TQM and its barriers/obstacles in implementation. **(SUMMER 2025, 7 Marks OR; SUMMER 2025, 3 Marks OR; WINTER 2025, 4 Marks – "What is the obstacles to implementing a TQM.")**

Other Important Questions:

1. TQM Elements:

- **Q.** What is Total Employee Involvement? How can a leader improve it? **(WINTER 2023, 7 Marks OR)**
- **Q.** What is the aim of Concurrent Engineering? **(WINTER 2024, 3 Marks)**
- **Q.** Explain Kaizen and poka - yoke. **(SUMMER 2026, 4 Marks)**

2. TPM and 5S:

- **Q.** Explain Total Productive Maintenance (TPM). **(SUMMER 2025, 4 Marks OR)**
- **Q.** Discuss the role of 5S in quality improvements in manufacturing sectors. **(WINTER 2024, 7 Marks OR)**

Chapter 3: Design of Experiments and Taguchi Methods

Repeated Questions:

1. DOE Basics:

- **Q.** Define factors, levels, and response in DOE with an example. / Define DOE and enlist its components. **(WINTER 2022, 7 Marks; SUMMER 2023, 3 Marks OR; SUMMER 2025, 7 Marks; WINTER 2025, 7 Marks – "Define DOE and enlist the components of DOE. Discuss Taguchi Quality Loss Function.")**
- **Q.** What is DOE? Enlist the types/Steps in experimental design. **(SUMMER 2022, 4 Marks; WINTER 2023, 3 Marks OR; WINTER 2024, 4 Marks OR; WINTER 2025, 3 Marks; SUMMER 2026, 4 Marks – "Describe experimental design with a suitable example.")**

2. Taguchi Method:

- **Q.** Discuss the Taguchi Quality Loss Function. **(WINTER 2022, 7 Marks; SUMMER 2023, 4 Marks OR; WINTER 2024, 4 Marks; WINTER 2025, 7 Marks – combined with DOE components)**
- **Q.** Discuss various steps in the Taguchi method. / Enlist the steps for achieving robustness. **(SUMMER 2022, 3 Marks OR; SUMMER 2023, 3 Marks; WINTER 2025, 4 Marks – "Discuss about Taguchi approach in context to DOE")**

3. Robust Design:

- **Q.** What do you understand by robust design? How do Taguchi techniques help achieve it? **(WINTER 2022, 4 Marks OR; WINTER 2024, 7 Marks; SUMMER 2025, 4 Marks OR; SUMMER 2026, 3 Marks – "Explain concept of Robust design in context to DOE")**

Other Important Questions:

1. DOE Terms, Importance and Factorial Designs:

- **Q.** Define following terms: (i) ANOVA (ii) Response (iii) Factorial Design. **(SUMMER 2022, 3 Marks)**
- **Q.** What is the difference between a run and a replication in DOE? What is the purpose of replication? **(SUMMER 2022, 4 Marks OR)**
- **Q.** What is the importance of DOE? **(WINTER 2024, 3 Marks)**
- **Q.** Elaborate Full factorial and Fractional factorial design. **(SUMMER 2026, 7 Marks)**

2. Risk Assessment:

- **Q.** Discuss the Risk Assessment procedures in design. **(WINTER 2025, 4 Marks)**

Chapter 4: JIT, TPM, and ISO Standards

Repeated Questions:

1. JIT and KANBAN:

- **Q.** Discuss the Just in Time (JIT) Concept. / Explain JIT with real field application. / Explain elements/pre-requisites of JIT. **(WINTER 2022, 3 Marks; WINTER 2022, 7 Marks OR; SUMMER 2023, 4 Marks; SUMMER 2025, 4 Marks; WINTER 2025, 3 Marks – "Discuss Just in Time Concept."; SUMMER 2026, 3 Marks – "Explain just in time manufacturing.")**
- **Q.** What is KANBAN? Explain its steps/benefits. / Short note on KANBAN. **(SUMMER 2022, 7 Marks OR; SUMMER 2023, 4 Marks OR; WINTER 2024, 4 Marks; WINTER 2025, 7 Marks – "Explain Quality Production through KANBAN.")**

2. Total Productive Maintenance (TPM):

- **Q.** Discuss the Pillars of Total Productive Maintenance (TPM). / Define and discuss TPM. **(SUMMER 2022, 7 Marks; SUMMER 2023, 7 Marks; WINTER 2024, 4 Marks OR; SUMMER 2026, 3 Marks – "Explain TPM along with advantages and application.")**

3. ISO Standards:

- **Q.** Explain the role/scope/barriers of ISO 14000 in managing environmental practices. **(WINTER 2022, 7 Marks; WINTER 2023, 4 Marks; WINTER 2024, 7 Marks OR; SUMMER 2025, 7 Marks; WINTER 2025, 7 Marks – "Explain basic concepts, scope and implementation barriers of ISO 14000")**
- **Q.** Explain Quality Management Standards – ISO 9000. / What is the need of ISO 9000? **(SUMMER 2023, 7 Marks OR; WINTER 2024, 3 Marks OR; SUMMER 2026, 7 Marks – "Write short notes on ISO 9000.")**

4. Six Sigma and Zero Defects:

- **Q.** What is Six Sigma? Briefly explain. **(SUMMER 2022, 4 Marks; SUMMER 2023, 7 Marks OR; WINTER 2024, 7 Marks; SUMMER 2026, 7 Marks – "Explain in details about six sigma process.")**
- **Q.** Define Zero defects. Discuss various steps in implementing Zero defects. **(WINTER 2022, 3 Marks OR; SUMMER 2025, 4 Marks OR; WINTER 2025, 7 Marks)**

Other Important Questions:

1. JIT and Jidoka:

- **Q.** What is JIDOKA? Explain in brief. **(SUMMER 2022, 3 Marks)**
- **Q.** Discuss the differences between a traditional push system and a JIT demand-pull system. **(WINTER 2022, 3 Marks OR)**

2. Maintenance Effectiveness and Cost of Quality:

- **Q.** What is Overall Equipment Effectiveness (OEE)? What are the standard benchmarks of OEE? **(SUMMER 2022, 3 Marks OR)**
- **Q.** Explain the Cost of Quality in detail. **(WINTER 2022, 4 Marks OR)**

3. ISO Standards:

- **Q.** Describe ISO 14000 and QS 9000 with example. **(SUMMER 2026, 4 Marks)**

Chapter 5: Contemporary Trends

Repeated Questions:

1. Lean and Agile Manufacturing:

- **Q.** Explain Lean Manufacturing. / What do you mean by Lean manufacturing? Discuss its wastes (Muda) and advantages. **(WINTER 2022, 7 Marks OR; SUMMER 2023, 3 Marks – part a on Muda; WINTER 2024, 4 Marks; WINTER 2025, 3 Marks – "What is Muda? Explain the various types of Muda."; SUMMER 2026, 4 Marks – "Describe about Lean manufacturing.")**
- **Q.** Explain Agile Manufacturing. **(SUMMER 2022, 4 Marks OR; WINTER 2022, 4 Marks OR; SUMMER 2026, 7 Marks – "Describe Agile manufacturing process.")**

2. Benchmarking and World Class Manufacturing:

- **Q.** Explain Benchmarking. / What are the four types of benchmarking? **(WINTER 2022, 3 Marks; SUMMER 2023, 3 Marks OR; WINTER 2023, 7 Marks OR; SUMMER 2025, 3 Marks; WINTER 2025, 3 Marks – "Explain briefly Bench Marking.")**
- **Q.** Explain World Class Manufacturing. **(SUMMER 2022, 7 Marks OR; WINTER 2022, 7 Marks; SUMMER 2026, 3 Marks – "Describe about world class manufacturing.")**

3. Concurrent Engineering:

- **Q.** Describe the concept of Concurrent Engineering. **(SUMMER 2023, 4 Marks OR; WINTER 2024, 3 Marks; WINTER 2025, 4 Marks)**

Other Important Questions:

1. Lean versus Agile:

- **Q.** Differentiate between Lean manufacturing and Agile manufacturing. **(SUMMER 2022, 4 Marks OR)**

2. Business Process Reengineering and Six Sigma:

- **Q.** What is Business Process Reengineering? What are its principles and advantages? **(WINTER 2024, 7 Marks)**
- **Q.** Briefly explain the concept of Six sigma with its advantages and limitations. **(WINTER 2022, 7 Marks OR)**

Chapter 6: Reliability Engineering

Repeated Questions:

1. Reliability Concepts:

- **Q.** Define Reliability. / What is reliability and failure? / Explain importance of reliability engineering. **(SUMMER 2023, 3 Marks OR; WINTER 2024, 3 Marks OR; WINTER 2024, 3 Marks; SUMMER 2026, 4 Marks – "Explain concept of Reliability with suitable example")**
- **Q.** Draw and explain the Bath-tub Curve. **(SUMMER 2022, 4 Marks OR; SUMMER 2025, 7 Marks; WINTER 2025, 7 Marks – "Explain the bathtub curve in terms of reliability.")**

2. Reliability Measures and Life Dispersion:

- **Q.** Define and Compare: MTTF, MTBF, MTTR. / Explain their significance. **(SUMMER 2022, 3 Marks; WINTER 2023, 4 Marks; WINTER 2024, 7 Marks OR)**
- **Q.** Define: Skewness and Kurtosis of life dispersion. **(SUMMER 2023, 4 Marks OR; WINTER 2025, 3 Marks)**

3. Maintainability, Availability and System Models:

- **Q.** Define Maintainability and Availability and compare with Reliability. **(WINTER 2023, 3 Marks; SUMMER 2025, 7 Marks OR; WINTER 2025, 7 Marks – "Define Maintainability and availability and compare it with reliability.")**
- **Q.** What are the types of System reliability models? Discuss with examples. **(SUMMER 2025, 7 Marks; WINTER 2025, 7 Marks)**

Other Important Questions:

1. Types and Parameters of Reliability:

- **Q.** Discuss evolution of reliability over product life cycle. **(SUMMER 2023, 7 Marks OR)**
- **Q.** Enlist types of Reliability and explain any three. **(WINTER 2023, 3 Marks OR)**
- **Q.** Explain field reliability. **(WINTER 2024, 4 Marks OR)**
- **Q.** What are the Reliability Parameters? **(WINTER 2025, 4 Marks)**
- **Q.** Elaborate design Reliability and Inherent Reliability. **(SUMMER 2026, 4 Marks)**
- **Q.** Describe Failure Mechanism and failure severity. **(SUMMER 2026, 7 Marks)**

2. Reliability Functions and Models:

- **Q.** Derive equation for hazard rate function using reliability, probability density function and cumulative distribution function. **(WINTER 2023, 4 Marks OR)**
- **Q.** Define cumulative function and reliability function. **(SUMMER 2026, 3 Marks)**
- **Q.** What is inspection and repair availability model? Explain a case for it. **(WINTER 2023, 7 Marks)**
- **Q.** Write short note on Reliability repairable system. **(SUMMER 2026, 7 Marks)**

3. Reliability Numericals:

- **Q.** A pump motor exhibiting a constant hazard rate has a reliability of 90 per cent from operating time of 1000 hrs. (i) What is the average failure rate of the pump motor? (ii) What is MTBF? (iii) What is the reliability of the item for an operating time of 2000 hours? and for 4000 hours? (iv) Corresponding to a reliability of 0.5, what is the operating time? **(SUMMER 2022)**
- **Q.** Reliability block diagram problem for a thermal power plant. [Diagram required – refer to the original question paper] **(SUMMER 2022 OR)**

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