

GUJARAT TECHNOLOGICAL UNIVERSITY

BE-7 SEMESTER – OLD PAPER – S22 TO S25 – QUESTION BANK

Subject Name & Code:

Quality and Reliability Engineering- 3171929

Unit 1: Introduction to Quality

Repeated Questions:

1. **Explain any three dimensions of Quality.**
 - **Appeared in:** Summer 2023 (03 Marks), Winter 2023 (04 Marks)
2. **List/Name five Quality Gurus and explain the contribution of any two.**
 - **Appeared in:** Summer 2023 (04 Marks), Winter 2022 (04 Marks)
3. **Differentiate between Inspection and Quality Control.**
 - **Appeared in:** Summer 2023 (07 Marks), Winter 2024 (03 Marks)
4. **Differentiate between Quality Control and Quality Assurance.**
 - **Appeared in:** Summer 2022 (04 Marks)
5. **Justify “Quality as a winning strategy” / “Quality products make a significant impact on revenues”.**
 - **Appeared in:** Summer 2022 (03 Marks), Winter 2024 (04 Marks)
6. **Give various definitions of Quality.**
 - **Appeared in:** Winter 2022 (04 Marks), Summer 2025 (04 Marks)

Other Important Questions:

- Define: (1) Quality (2) TQM (3) Poka yoke. (Winter 2022, 03 Marks)
- How Juran, Deming and Crosby define Quality? (Winter 2023, 03 Marks)
- Enlist the various phases of Quality Revolution and discuss inspection, quality control and quality assurance. (Summer 2025, 07 Marks - OR part)
- What do you mean by TQM? Also discuss principles of TQM. (Winter 2024, 07 Marks)

Unit 2: Total Quality Management (TQM)

Repeated Questions:

1. **Define and explain Quality Circle. / Explain the process of operation of quality circle.**
 - **Appeared in:** Summer 2023 (03 Marks), Winter 2024 (03 Marks), Winter 2022 (03 Marks)
2. **Explain the concept of 5S.**
 - **Appeared in:** Summer 2023 (04 Marks), Winter 2022 (04 Marks), Summer 2025 (03 Marks), Summer 2022 (07 Marks - part c)
3. **Explain Poka-Yoke with two examples.**
 - **Appeared in:** Summer 2023 (03 Marks), Summer 2022 (03 Marks)
4. **Explain the PDCA cycle.**
 - **Appeared in:** Summer 2023 (04 Marks), Winter 2022 (04 Marks), Winter 2024 (07 Marks - OR part)
5. **Define QFD and Discuss the House of Quality (Product Planning Matrix).**
 - **Appeared in:** Summer 2023 (07 Marks), Winter 2022 (07 Marks), Winter 2023 (07 Marks), Summer 2025 (07 Marks)
6. **What is FMEA? Explain how it helps in ensuring quality. / Draw its format.**
 - **Appeared in:** Summer 2023 (07 Marks - OR part), Winter 2022 (07 Marks - OR part), Winter 2023 (07 Marks), Summer 2022 (07 Marks - OR part)
7. **Discuss the basic 7 Quality Control Tools.**
 - **Appeared in:** Summer 2023 (07 Marks), Winter 2022 (07 Marks)
8. **List out and explain the 7 new management/quality improvement tools.**
 - **Appeared in:** Summer 2023 (07 Marks - OR part), Winter 2024 (07 Marks)
9. **Describe the concept of Kaizen.**
 - **Appeared in:** Winter 2022 (03 Marks), Winter 2024 (04 Marks), Summer 2025 (03 Marks)
10. **Discuss TQM and its barriers/obstacles in implementation.**
 - **Appeared in:** Summer 2025 (07 Marks - OR part), Summer 2025 (03 Marks - OR part)

Other Important Questions:

- What is Total Employee Involvement? How can a leader improve it? (Winter 2023, 07 Marks - OR part)
- Explain Total Productive Maintenance (TPM). (Summer 2025, 04 Marks - OR part)
- Discuss the role of 5S in quality improvements in manufacturing sectors. (Winter 2024, 07 Marks - OR part)
- What is the aim of Concurrent Engineering? (Winter 2024, 03 Marks)

Unit 3: Introduction to Design of Experiments (DOE)

Repeated Questions:

1. **Define factors, levels, and response in DOE with an example. / Define DOE and enlist its components.**
 - **Appeared in:** Summer 2023 (03 Marks - OR part), Winter 2022 (07 Marks), Summer 2025 (07 Marks)
2. **Discuss the Taguchi Quality Loss Function.**
 - **Appeared in:** Summer 2023 (04 Marks - OR part), Winter 2022 (07 Marks), Winter 2024 (04 Marks)
3. **Discuss various steps in the Taguchi method. / Enlist the steps for achieving robustness.**
 - **Appeared in:** Summer 2023 (03 Marks), Summer 2022 (03 Marks - OR part)
4. **What is DOE? Enlist the types/Steps in experimental design.**
 - **Appeared in:** Winter 2023 (03 Marks - OR part), Summer 2022 (04 Marks), Winter 2024 (04 Marks - OR part)
5. **What do you understand by robust design? How do Taguchi techniques help achieve it?**
 - **Appeared in:** Winter 2022 (04 Marks - OR part), Winter 2024 (07 Marks), Summer 2025 (04 Marks - OR part)

Other Important Questions:

- Define following terms: (i) ANOVA (ii) Response (iii) Factorial Design. (Summer 2022, 03 Marks)
- What is the difference between a run and a replication in DOE? What is the purpose of replication? (Summer 2022, 04 Marks - OR part)
- What is the importance of DOE? (Winter 2024, 03 Marks)

Unit 4: JIT, TPM, and ISO Standards

Repeated Questions:

1. **Discuss the Just in Time (JIT) Concept. / Explain JIT with real field application. / Explain elements/pre-requisites of JIT.**
 - **Appeared in:** Winter 2022 (03 Marks), Summer 2023 (04 Marks), Winter 2022 (07 Marks - OR part), Summer 2025 (04 Marks)
2. **What is KANBAN? Explain its steps/benefits. / Short note on KANBAN.**
 - **Appeared in:** Summer 2023 (04 Marks - OR part), Summer 2022 (07 Marks - OR part), Winter 2024 (04 Marks)
3. **Discuss the Pillars of Total Productive Maintenance (TPM). / Define and discuss TPM.**
 - **Appeared in:** Summer 2023 (07 Marks), Summer 2022 (07 Marks), Winter 2024 (04 Marks - OR part)
4. **Explain the role/scope/barriers of ISO 14000 in managing environmental practices.**
 - **Appeared in:** Winter 2023 (04 Marks), Summer 2025 (07 Marks), Winter 2022 (07 Marks), Winter 2024 (07 Marks - OR part)
5. **Explain Quality Management Standards - ISO 9000. / What is the need of ISO 9000?**
 - **Appeared in:** Summer 2023 (07 Marks - OR part), Winter 2024 (03 Marks - OR part)
6. **What is Six Sigma? Briefly explain.**
 - **Appeared in:** Summer 2023 (07 Marks - OR part), Summer 2022 (04 Marks), Winter 2024 (07 Marks)

Other Important Questions:

- What is JIDOKA? Explain in brief. (Summer 2022, 03 Marks)
- Discuss the differences between a traditional push system and a JIT demand-pull system. (Winter 2022, 03 Marks - OR part)
- Explain the Cost of Quality in detail. (Winter 2022, 04 Marks - OR part)
- What is Overall Equipment Effectiveness (OEE)? What are the standard benchmarks of OEE? (Summer 2022, 03 Marks - OR part)
- Define Zero defects. Discuss various steps in implementing Zero defects. (Winter 2022, 03 Marks - OR part), Summer 2025 (04 Marks - OR part)

Unit 5: Contemporary Trends

Repeated Questions:

1. **Explain Lean Manufacturing. / What do you mean by Lean manufacturing? Discuss its wastes (Muda) and advantages.**
 - **Appeared in:** Winter 2022 (07 Marks - OR part), Winter 2024 (04 Marks), Summer 2023 (03 Marks - part a on Muda)
2. **Explain Agile Manufacturing.**
 - **Appeared in:** Winter 2022 (04 Marks - OR part), Summer 2022 (04 Marks - OR part)
3. **Explain Benchmarking. / What are the four types of benchmarking?**
 - **Appeared in:** Summer 2023 (03 Marks - OR part), Winter 2022 (03 Marks), Summer 2025 (03 Marks), Winter 2023 (07 Marks - OR part)
4. **Describe the concept of Concurrent Engineering.**
 - **Appeared in:** Summer 2023 (04 Marks - OR part), Winter 2024 (03 Marks)
5. **Explain World Class Manufacturing.**
 - **Appeared in:** Winter 2022 (07 Marks), Summer 2022 (07 Marks - OR part)

Other Important Questions:

- What is Business Process Reengineering? What are its principles and advantages? (Winter 2024, 07 Marks)
- Differentiate between Lean manufacturing and Agile manufacturing. (Summer 2022, 04 Marks - OR part)
- Briefly explain the concept of Six sigma with its advantages and limitations. (Winter 2022, 07 Marks - OR part)

Unit 6: Reliability Engineering

Repeated Questions:

1. **Define Reliability. / What is reliability and failure? / Explain importance of reliability engineering.**
 - **Appeared in:** Summer 2023 (03 Marks - OR part), Winter 2024 (03 Marks - OR part), Winter 2024 (03 Marks)
2. **Define and Compare: MTTF, MTBF, MTTR. / Explain their significance.**
 - **Appeared in:** Winter 2023 (04 Marks), Summer 2022 (03 Marks), Winter 2024 (07 Marks - OR part)
3. **Draw and explain the Bath-tub Curve.**
 - **Appeared in:** Summer 2025 (07 Marks), Summer 2022 (04 Marks - OR part)
4. **Define Maintainability and Availability and compare with Reliability.**
 - **Appeared in:** Winter 2023 (03 Marks), Summer 2025 (07 Marks - OR part)
5. **What are the types of System reliability models? Discuss with examples.**
 - **Appeared in:** Summer 2025 (07 Marks)

Other Important Questions:

- Define: Skewness and Kurtosis of life dispersion. (Summer 2023, 04 Marks - OR part)
- Discuss evolution of reliability over product life cycle. (Summer 2023, 07 Marks - OR part)
- Derive equation for hazard rate function using reliability, probability density function and cumulative distribution function. (Winter 2023, 04 Marks - OR part)
- What is inspection and repair availability model? Explain a case for it. (Winter 2023, 07 Marks)
- Enlist types of Reliability and explain any three. (Winter 2023, 03 Marks - OR part)
- Explain field reliability. (Winter 2024, 04 Marks - OR part)

Numerical Questions from this Unit

1. **From Summer 2022, Q5 (c):** 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?
 - **Solution Approach:** This uses the exponential reliability model $R(t) = e^{-\lambda t}$.
 - (i) Given $R(1000) = 0.9$, so $0.9 = e^{-\lambda * 1000}$. Solve for failure rate λ .
 - (ii) For exponential distribution, $MTBF = 1/\lambda$.
 - (iii) Use $R(2000) = e^{-\lambda * 2000}$ and $R(4000) = e^{-\lambda * 4000}$.
 - (iv) Set $R(t) = 0.5$, so $0.5 = e^{-\lambda t}$. Solve for t .
2. **From Summer 2022, Q5 (c) OR part:** Reliability block diagram problem for a thermal power plant.
 - **Solution Approach:** This requires knowledge of series and parallel system reliability calculations.
 - **If pump (R1) works:** Components are in a series-parallel combination. Calculate the reliability of the parallel paths first, then multiply with series components.
 - **If pump (R1) fails:** The system configuration changes. You need to analyze the new block diagram to find the reliability.
