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Slot: D2 + TD2
Digital Assignment - II

Q1

Ans TRIZ is a systematic problem solving methodology that aims to find innovative solution to engineering and technical problems. The theory of Inventive Problem Solving (TRIZ) is based on the premise that there are universal principles that can be applied to solve problem creatively and systematically. Key principles of TRIZ includes:

1. Contradiction: TRIZ identifies contradictions in the system, where improving one aspect may worsen another. Resolving these contradiction leads to innovative solutions.
2. 40 inventive principles: TRIZ provides a set of 40 principles that have been identified as common patterns in inventive solutions. These principles serve as a toolkit for generating creative ideas.
3. Ideal Final Result (IFR): TRIZ encourages defining an IFR, a state where all contradictions are resolved.
4. Su-Field analysis: This is to break down problem into subsystems (Su) and fields. This helps to identify root cause of subsystems.
5. Pattern of evolution: It recognizes that systems evolve through specific patterns and understanding these patterns.

By applying TRIZ, organizations can systematically analyze problems, identify inventive principles and generate creative solutions.

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Q2 Ans

The DMAIC process, which stands for Define, measure, analyze, improve and control is a key component of the Six Sigma Methodology. Designed experiments are particularly useful in the "Improve" step of the DMAIC process, Here's why:

1. Systematic Identification of Variables: DOE allows for a systematic and structured approach to vary and study the effects of different factors or variables simultaneously. This is crucial in "Improve" phase.
2. Efficient exploration of Variables: Instead of changing one variable at a time, which can be time-consuming and may not capture interaction b/w variables, DE involves changing multiple variable in a controlled manner
3. Statistical Rigor: DE incorporate statistical principle to analyze and interpret the results. This helps in drawing reliable conclusion about the effects of different variables on the process.
4. Optimization of process condition: DE provides a structured way to explore the design space and identify the optimal process condition.
5. Interaction Detection: DE are designed to experiment, detect and quantify these interactions, providing insights into how variables may work together.

6. Resource efficiency: By using DE, resources are used more efficiently compared to trial and error methods.

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Q3 try

Implementing six sigma in industries involves a structured and data driven approach to improve processes. Here's a detailed explanation to implement:

1. Leadership commitment: Successful implementation starts with strong leadership commitment.
2. Formation of cross functional teams: typically consists of individuals with diverse skills.
3. Define: In this phase, the project goals, scope, and objective are clearly defined.
4. Measure: This involves quantifying the current state of process, KPIs are identified.
5. Analyze: Team analyzes the collected data to identify root cause of defects or process variation.
6. Improve: focus is on implementing solutions to address the identified issues.
7. Control: this phase aims to ensure that improvements are sustained over time. Control plans are developed & SPC tools are implemented.
8. DMAIC Methodology: This is the core of six sigma implementation, provides a systematic and structured approach to problem solving.
9. Training and certification: Training of team members is done.
10. Data driven decision making
11. Continuous improvement culture
12. Integration with organizational goals.

13. Project selection and prioritization.
14. Recognition and rewards.
15. Review and audit.
16. Bench marking and best practices
17. Project closure and Documentation.

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Q4 Ans

Here's a brief discussion about the relevance of a QMS in the content of ISO standards:

1. Standardization of processes.
This " is essential for achieving consistency, efficiency and repeatability in the delivery of product services.

2. Compliance with ISO standards
ISO standards such as ISO 9001 set out specific requirements for organizations to follow. This document is crucial for compliance.

3. Document control:
QMS emphasizes the importance of document control and related to processes, procedures.

4. Continuous improvements
QMS facilitates the identification of areas for improvements through processes like internal audits, corrective & preventive actions.

5. Risk management:
As highlighted in ISO 9001:2015, identifying, assessing and mitigating risks are crucial

6. Customer satisfaction: All needs are fulfilled

7. Training and competence
It emphasis the importance of competent personnel. QMS helps in documenting

training programs.

9. Management commitment and Accountability
   It stresses the importance of leadership commitment to quality.

10. Facilitations of Audits and assessments
    auditors review an organisations documents procedures and processes.

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Qs Try

Here's an outline for designing an ISO14001 environmental management system (EMS) for a specific organization:

1. Context of the organization:
   - Identify internal and external factors.
   - Define scope and context.
2. Leadership and policy:
   - Demonstrate top management commitment
   - Develop a concise environmental policy.
3. Planning
   - Identify and asses environmental aspects.
   - evaluate legal requirements.
   - Set objectives.
4. Implementation and operations
   - Develop an environmental mgnt system.
   - Define roles and responsibilities.
   - Provide training.
5. Monitoring and measurement
   - Regularly evaluate compliance.
   - Implement incident investigation
6. Evaluation of compliance
7. Review of environmental performance.
8. Documentation and record keeping.

9. Continual Improvements
10. Integration with other management systems.

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Q6
Ans =>

(a) Serial Configuration

The components are arranged in series and System fails if any one of the component fails.

If there are n components in a series with reliabilities $R_1, R_2, R_3, \ldots R_n$ the system reliability ($R_s$) is given by:

$$R_s = R_1 \times R_2 \times R_3 \times \ldots \times R_n$$

(b) Parallel configuration

The components are arranged in parallel and system fails if all the component fails

Here,

$$R_p = 1 - (1-R_1) \times (1-R_2) \times \ldots \times (1-R_n)$$

This expression is derived from the fact that the system fails if and only if all component fails.