GE8077 TOTAL QUALITY MANAGEMENT L T P C 3 0 0 3

OBJECTIVE:

- To facilitate the understanding of quality management principles and process.

UNIT I INTRODUCTION 9

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention.

UNIT II TQM PRINCIPLES 9

Leadership - Quality Statements, Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS AND TECHNIQUES I 9

The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.

UNIT IV TQM TOOLS AND TECHNIQUES II 9

Quality Circles - Cost of Quality - Quality Function Deployment (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.

UNIT V QUALITY MANAGEMENT SYSTEM 9

Introduction—Benefits of ISO Registration—ISO 9000 Series of Standards—Sector-Specific Standards—AS 9100, TS16949 and TL 9000-- ISO 9001 Requirements—Implementation—Documentation—Internal Audits—Registration--**ENVIRONMENTAL MANAGEMENT SYSTEM:** Introduction—ISO 14000 Series Standards—Concepts of ISO 14001—Requirements of ISO 14001—Benefits of EMS.

TOTAL: 45 PERIODS

OUTCOME:

- The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

TEXT BOOK:

1. Dale H.Besterfiled, Carol B.Michna,Glen H. Besterfield,Mary B.Sacre,Hemant Urdhwareshe and Rashmi Urdhwareshe, “Total Quality Management”, Pearson Education Asia, Revised Third Edition, Indian Reprint, Sixth Impression, 2013.

REFERENCES:

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, First Indian Edition, Cengage Learning, 2012.
2. Janakiraman. B and Gopal .R.K., "Total Quality Management - Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.
3. Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.
4. ISO 9001-2015 standards

COURSE OUTCOMES (COs)		
C404.1	**:**	To understand the frame work of Total Quality Management emphasizing the importance of Quality and Customers
C404.2	**:**	To understand the TQM principles with reference to qualities of Leadership, Involvement and Team work for the continuous process improvement
C404.3	**:**	To understand and apply the conventional and new management tool procedures for total quality Management
C404.4	**:**	To learn the various tools of Performance measures for the implementation of quality management
C404.5	**:**	To understand the need for quality regulatory system and its documentation procedures

MAPPING BETWEEN COs, POs AND PSOs

Cos	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C404.1	-	-	-	1	1	2	1	2	2	1	2	2	1	-	1
C404.2	-	-	-	-	2	2	1	2	3	2	2	2	-	1	3
C404.3	1	2	2	1	3	1	-	1	2	1	3	1	-	-	2
C404.4	1	2	3	2	2	-	-	1	-	-	1	1	1	1	1
C404.5	-	1	-	-	2	2	1	1	1	1	1	2	-	-	1

RELATION BETWEEN COURSE CONTENTS WITH COs

Sl. No.	Knowledge level	Contents	COs
		UNIT I INTRODUCTION	
1	U/R	Introduction, Need for quality , Evolution of quality, Definitions of quality	**C404.1**
2	U/R/Ap	Dimensions of product and service quality	**C404.1**
3	U/R	Basic concepts of TQM and TQM Framework	**C404.1**
4	U/R/Ap	Contributions of Deming, Juran and Crosby	**C404.1**
5	U/R	Barriers to TQM, Costs of quality, Quality statements	**C404.1**
6	U/AP	Customer focus, Customer orientation, Customer satisfaction, Customer complaints, Customer retention	**C404.1**
		UNIT II TQM PRINCIPLES	
1	U/R/Ap	Leadership - Strategic quality planning, Quality Councils	**C404.2**
2	U/Ap	Employee involvement - Motivation, Empowerment	**C404.2**
3	U/Ap	Team and Teamwork and Quality circles	**C404.2**
4	U/Ap	Recognition and Reward, Performance appraisal	**C404.2**
5	U/Ap	Continuous process improvement - PDCA cycle, 5S, Kaizen	**C404.2**

6	U/R/Ap	Supplier partnership - Partnering, Supplier selection, Supplier rating	**C404.2**
UNIT III TQM TOOLS AND TECHNIQUES I			
1	U/R/Ap	The seven traditional tools of quality	**C404.3**
2	U/R/Ap	New management Tools	**C404.3**
3	U/R/Ap	Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT	**C404.3**
4	U/R/Ap	Bench marking - Reason to bench mark, Bench marking process	**C404.3**
5	U/R/Ap	FMEA - Stages, Types	**C404.3**
UNIT IV TQM TOOLS AND TECHNIQUES II			
1	U/R/Ap	Control Charts	**C404.4**
2	U/R/Ap	Process Capability	**C404.4**
3	U/R/Ap	Concepts of Six Sigma	**C404.4**
4	U/R/Ap	Quality Function Development (QFD)	**C404.4**
5	U/R/Ap	Taguchi quality loss function	**C404.4**
6	U/R/Ap	TPM - Concepts, improvement needs	**C404.4**
7	U/R/Ap	Performance measures.	**C404.4**
UNIT V QUALITY SYSTEMS			
1	U/R	Need for ISO 9000	**C404.5**
2	U/R/Ap	ISO 9001-2008 Quality System - Elements, Documentation	**C404.5**
3	U/R	Quality Auditing	**C404.5**
4	U/R	QS 9000 - ISO 14000 - Concepts, Requirements and Benefits	**C404.5**
5	U/R/Ap	TQM Implementation in manufacturing and service sectors	**C404.5**
Topics beyond the Syllabus			
1	U/Ap	Case study related to quality auditing	**C404.5**

R – Remember Ap – Apply An – Analyze
U – Understand E- Evaluate C-Create

UNIT I INTRODUCTION 9

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention.

PART – A

1	**Define Total Quality Management (TQM).** 1. The art of managing the total organization to achieve excellence in all spheres of activity. (Bester field). 2. The integration of all functions and processes within an organization in order to achieve the continuous improvement of the quality of goods and services. (Omachonu). TQM is the management approach of an organization, centered on quality, based on the participation of all its members and aiming at long-term success through customer satisfaction, and benefits to all members of the organization and to society. Total -Made up of the whole Quality -Degree of excellence a product or service provides Management -Act, art, or manner of handling, controlling, directing, etc. TQM is an enhancement to the traditional way of doing business. It is the art of managing the whole to achieve excellence. It is defined both a philosophy and a set of guiding principles that represent the foundation of a continuously improving organization. It is the application of quantitative methods and human resources to improve all the processes within an organization and exceed customer needs now and in the future. It integrates fundamental managementtechniques, existing improvement efforts, and technical tools under a disciplined approach.
2	**What are the elements of TQM? (Jan/Feb 2022)** There are eight key elements of TQM such as: Ethics, Integrity, Trust, Training, Teamwork, Leadership, Recognition, Communication.
3	**Mention the basic features of TQM.** 1. Management commitment, 2. Focus on customer (both external and internal), 3. Employee involvement, empowerment, 4. Continuous improvement, 5. Treating suppliers as partners and 6. Establish performance measures for processes.

4	**What are the benefits of TQM?** Improved quality, higher productivity, employee participation, teamwork, working relationships, customer satisfaction, employee satisfaction, communication, profitability, market share, and stock price performance
5	**Define quality.** Quality = Performance/Expectations 1. Predictable degree of uniformity and dependability at low cost and suited to the market - Deming 2. Fitness for use – Juran 3. Conformance to requirements – Crosby
6	**What are the various quality statements?** Quality statements include the vision statement, mission statement, and quality policy statement.
7	**What is a vision statement?** A short declaration of what an organization aspires to be in the future. It is an ideal state that an organization continually strives to achieve. It is timeless, inspirational, and becomes deeply shared within the organization
8	**What is a mission statement?** The mission statement answers the following questions: who we are, who are our customers, what we do, and how we do it. The mission provides the guide map, milestones for achieving the vision.
9	**What is Deming cycle?** P-D-S-A (Plan-Do-Study-Act) cycle of continuous improvement.
10	**What are the major dimensions of product quality? (Nov/Dec 2017)** Performance, features, usability, conformance to standards/specifications, reliability, durability, maintainability, etc
11	**What are the three levels of quality in the Kano model of customer satisfaction?** 1. Basic quality, 2. Performance quality and 3. Excitement quality. The products corresponding to these three quality levels were termed as 'Dissatisfies', 'Satisfiers' and 'Delighters/Exciters' respectively in the Kano model.
12	**What is importance of customer retention?** It costs a company six times more to sell a product to a new customer than it does to sell to an

<table>
<tr><td></td><td>existing one. Loyal customers generate more revenue, and are also cheaper to maintain. Customer loyalty facilitates cross-selling/up-selling of a company's other products/services, and also acts as an effective barrier to the entry of competition.</td></tr>
<tr><td>13</td><td>Distinguish between internal customer and external customer.
<table>
<tr><th>External customer</th><th>Internal customer</th></tr>
<tr><td>An external customer exists outside the organization and can be defined in many ways – user, buyer, influencer.
He generally falls into one of three categories: current, prospective, or lost customer.</td><td>Every function within the organization (engineering, production, order processing, etc.) has an internal customer. Every person in a process is considered a customer of the preceding operation. For example, Manufacturing is a customer for Purchasing, and Dispatching is a customer for Packaging.</td></tr>
</table></td></tr>
<tr><td>14</td><td>What do you mean by service quality?
Service quality is nothing but, Service duration, timeliness, completeness, consistency, convenience, accuracy, courtesy, etc</td></tr>
<tr><td>15</td><td>What is meant by cost of quality?
Quality costs are defined as costs associated with non-achievement of product/service quality. In simple terms, quality cost is the cost of poor products/services. All costs associated with poor quality and its correction are integrated into one system to enhance the quality management function.</td></tr>
<tr><td>16</td><td>What are the four categories of quality costs? (Nov/Dec2016)
1. Prevention costs, 2. Appraisal costs, 3. Internal failure costs and 4. External failure costs.</td></tr>
<tr><td>17</td><td>What are internal failure costs?
These are costs required to identify, repair, replace, or dispose off defective products/services prior to delivery to the customer.</td></tr>
<tr><td>18</td><td>Mention the names of some major contributors to the quality movement. (OR)
List the quality gurus in TQM.
1. Edwards Deming, 2. Joseph M. Juran, 3. Philip Crosby, 4. Feigenbaum, 5. Ishikawa, 6. Taguchi, 7. Shingo and 8. Walter Shewhart.</td></tr>
<tr><td>19</td><td>Mention the four pillars of TQM?
Customer satisfaction, continuous improvement, Quality leadership and systems approach</td></tr>
</table>

20	**What is the importance of customer focus for an organization?** Customers are the most important asset of an organization. An organization's success depends on how many customers it has, how much they buy, how often they buy, and how long they are retained (loyalty).
21	**What is Deming's "System of Profound Knowledge"?** Deming summarized his philosophy in what he called "A System of Profound Knowledge". It comprised of 4 parts: 1. Appreciation for a system, 2. Some knowledge of the theory of variation, 3. Theory of knowledge, and 4. Psychology. Deming recognized the synergy among these diverse subjects and developed them into a theory of management.
22	**What are some major obstacles to TQM implementation?** Lack of management commitment, Inability to change organizational culture, Improper planning, Lack of continuous training and education, Paying inadequate attention to internal and external customers, Inadequate use of empowerment and teamwork, Lack of employee involvement, Emphasis on short-term results, etc.
23	**What is customer satisfaction?** Customer satisfaction is a measure of the degree to which a product or service meets the customer's expectations.
24	**How can quality be quantified? (April/May 2016)** Quality can be expressed as P/E, where P denotes performance and E denotes expectation.
25	**What do you mean by service quality? (April/May 2016; Nov/Dec 2017)** Quality of service offered is judged based on the following dimensions: Reliability, Responsiveness, Assurance, Empathy, Tangibles etc
26	**What are the different ways to create customer oriented culture in an industry? (Nov/Dec 2016)** 1. Base their values on customer feedback 2. Involve their employees in the development of values 3. Link these values to their brand 4. Encourage their employees to align their behaviors to the values. 5. Reward their employees for living the brand.
27	**What are the four absolutes of quality defined by Crosby? (April/May 2017)**

	1. Quality is defined as conformance to requirements, not goodness 2. The system for achieving quality is prevention, not appraisal 3. The performance standard is zero defects, not that's close enough and 4. The measure of quality is the price of non-conformance, not indexes.
28	**Define quality policy statements. (April/May 2017; Nov/Dec 2017)** Quality policy statement is a document developed by management to express the directive of the top management with respect to quality.
29	**What are the tangible benefits and intangible benefits of TQM? (Jan/Feb 2022)** The common tangible benefits would be cash flow, cash income, and cost reduction. In essence, it is the net profit gain for a running business. The intangible benefits would include raising customer satisfaction rate, improved employee motivation, growing market share, and better reputation for a company's brand. In the IT industry, the intangible benefits are important, especially for many startup companies.
30	**Why is quality required in products and services today? MAY/JUNE 2014** Quality in business, engineering and manufacturing has a pragmatic interpretation as the non-inferiority or superiority of something; it is also defined as fitness for purpose. Quality is a perceptual, conditional, and somewhat subjective attribute and may be understood differently bydifferent people. There are five aspects of quality in a business context: • Producing – providing something. • Checking – confirming that something has been done correctly. • Quality Control – controlling a process to ensure that the outcomes arepredictable. • Quality Management – directing an organization so that it optimizes itsperformance through analysis and improvement. • Quality Assurance – obtaining confidence that a product or service will besatisfactory. (Normally performed by a purchaser.
31	**List the characteristics of TQM.** • TQM is a customer oriented • TQM required a long term commitment for continuous improvement of all processes. • TQM is teamwork.

	• TQM requires the leadership of top management and continuous involvement • TQM is a strategy for continuous improving performance at all levels and in all areas ofresponsibility.
32	**What are the general duties of a quality council?** • Develop, with input from all personnel, the core values, vision statement, mission statement, and quality policy statement. • Develop the strategic long-term plan with goals and the annual quality improvement program with objectives. • Create the total education and training plan. • Determine and continually monitor the cost of poor quality. • Determine the performance measures for the organization, approve those for thefunctional areas, and monitor them.
33	**List the tools used for feedback.** Comment cards, Customer questionnaire (online, phone and mail surveys), Focus groups, Toll-free telephone lines, Customer visits, Report cards, Post transaction surveys, Employee feedback, and Social media.
34	**Define Customer complaint, Customer Retention and Customer care.** A **customer complaint** may be defined as an expression of dissatisfaction with a product/ service, either orally or in writing, from an internal or external customer. **Customer retention** is the process of retaining the existing customers. It is obvious that customer retention is more powerful and effective than customer satisfaction. **Customer care** can be defined as every activity which occurs within the organization that ensures that a customer is not only satisfied but also retained.
	PART – B
1	**Discuss in detail the dimensions of quality in the context of service/product. (Nov/Dec 2016, Jan/Feb 2022)**
2	**Explain the Juran's view of TQM. / Discuss Juran's principle of quality improvement. (April/May 2013) / Explain in detail about Juran Trilogy. (April/May 2014; April/May 2016)**

3	**Explain the basic concepts and evolution of TQM (Jan/Feb 2022).**
4	**Explain Deming's principles for quality achievement. / Explain Deming's fourteen principles of quality management. How do you feel that these will be useful in today's context in service industry? (April/May 2014; Nov/Dec 2016; Nov/Dec 2017,Jan/Feb 2022)**
5	**Elaborate the fourteen steps involved in Crosby's total quality approach. (April/May 2017)**
6	**Explain the TQM framework.**
7	**State and explain the barriers to TQM implementation in an organization. / What are the barriers while implementing TQM? Also explain evolution of quality. (May/June 2016)**
8	**What do you understand by the term quality statements? Elaborate them with examples. (April/May 2017)**
9	**Illustrate the various steps in the customer satisfaction process. (Nov/Dec 2016)**
10	**Explain the issues related to customer complaints. MAY/JUNE 2015 (or) Explain the common customer feedback collection tools?**
11	**Discuss the implementation of TQM with a case study in a manufacturing sector. (June/July 2021).**
	PART – C
12	**Explain the role of senior management in TQM implementation. (Nov/Dec 2016)**
13	**Explain the contributions of Crossby to TQM.**
14	**(i) Describe the various dimensions of quality with respect to the following: quality in products and quality in services.** **(ii) Explain the common customer feedback collection tools. (April/May 2017)**
15	**Why to measure quality costs? Classify the various types of quality costs and give examples. (Nov/Dec 2017)**
UNIT II TQM PRINCIPLES 9 Leadership - Quality Statements, Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.	
	PART – A
1	**List out any four benefits of employee involvement? (April/May 2016)**

	Conformance, acceptance, contribution, commitment, cooperation, concentration, accountability, ownership.
2	**What is the Juran Trilogy (Quality Trilogy)?** The Juran Trilogy (Quality Trilogy) consists of three inter-related processes – quality planning, quality control, and quality improvement – for managing quality.
3	**What are the roles assigned to people in quality circles?** The QC organization has a four-tier structure consisting of Members, Leaders, Facilitators, and Steering Committee **.**
4	**Mention the major contribution of Feigenbaum to quality.** He was the originator of the concept of Total Quality Control (TQC). His concept of Total Quality Control was used as the foundation by the Japanese for their practice called 'Company-Wide Quality Control' [CWQC], which began in the 1960s and later evolved into TQM.
5	**What are quality circles (QC)? (Nov/Dec 2017)** QC is a small team of people (around 8 to 10) coming from the same work area/department who voluntarily meet on a regular basis (about an hour every week) to identify, investigate, analyze and solve work-related problems. QC can be viewed from three angles: 1. as a form of participative management, 2. as a HRD technique and 3. as a problem-solving technique.
6	**What are Crosby's four absolutes of quality management?** 1. Quality means conformance to requirements, not elegance. 2. Quality is achieved by prevention, not appraisal. 3. The performance standard is zero defects, not acceptable quality levels. Quality is free. 4. Quality is measured by the price of non-conformance, not indexes
7	**What are the steps in implementing quality circle projects?** 1. Select the problem, 2. Study the problem, 3. Plan the improvement, 4. Carry out the improvement 5. Check the results, 6. Form conclusions, 7. Present to management, 8. Obtain approval and 9. Implement on regular basis.
8	**Mention some tools used by quality circles for solving problems.** Data collection, Brainstorming, Check sheets, Pareto Analysis, Cause & Effect diagrams, Control charts, Presentation techniques, etc. are used by quality circles in solving problems.

9	**Mention some major objectives of quality circle projects.** 1. Improve quality and productivity, 2. Cost reduction, 3. Effective utilization of resources, 4. Avoid unnecessary errors, defects and 5. Solve work-related problems that interfere with production.
10	**What is 5 s? / What are the Japanese 5S principles?** The 5S's stand for five Japanese words: Seiri, Seiton, Seiso, Seiketsu and Shitsuke. In English, they mean Sort, Arrange, Clean up, Systematize, and Discipline respectively.
11	**What does Seiri mean?** Separate out all unnecessary things and remove them, retaining only necessary things.
12	**What does Seiton mean?** Seiton means orderliness. It means setting everything in proper order so that they can be easily accessed for use and quickly put away in their proper locations after use.
13	**What does Seiso mean?** Keep machinery and work environment clean.
14	**What does Seiketsu mean?** Develop routine practices for orderly, systematic working.
15	**What does Shitsuke mean?** Impart systematic training and coaching to ensure discipline in 5S implementation
16	**Explain Kaizen. (April/May 2017)** Kaizen, which is a Japanese word that means gradual and orderly continuous improvement, is a philosophy that covers all business activities and everyone in an organization. In the kaizen philosophy, improvement in all areas of business – cost, meeting delivery schedules, employee safety and skill development, supplier relations, new product development, and productivity – serve to improve the quality of the firm. Thus, any activity directed toward improvement falls under the kaizen umbrella.
17	**Explain supplier rating.** A supplier rating system (often called a scorecard system) is usually based on quality, delivery, and service; however, some customers have added other categories, such as lead time, product support, technology, etc.
18	**Define empowerment.** Empowerment requires a sincere belief and trust in people. It involves employees directly in

	decision-making processes, giving them the security and confidence to make decisions, and providing them with the necessary tools and training.
19	**Distinguish between reward and recognition.** Creating incentives for suppliers is one way to ensure that they remain committed to a quality improvement strategy. Incentives may be in the form of a preferred supplier category with its rewards. Recognition may be in the form of publication of outstanding contributions in the customer's newsletter, a letter of commendation, or a plaque.
20	**Why should suppliers be treated as partners?** Costs due to inferior materials/components from suppliers increase costs in the later stages of production. Suppliers themselves are part of the whole system and hence should be treated as long-term partners.
21	**Mention some benefits of implementing 5S principles.** 5S increases productivity, eliminates waste, reduces inventory, creates a pleasant workplace, improves safety, and increases the overall efficiency and effectiveness of people and machines
22	**What are the functions of quality circles? (April/May 2016)** QC is a small team of people coming from the same work area/department who voluntarily meet on a regular basis to identify, investigate, analyze and solve work related problems. They improve quality and productivity, concentrate on cost reduction, plan effective utilization of resources, avoid unnecessary errors, defects etc.
23	**How employee involvement can be improved in an organization? (Nov/Dec 2016)** 1. Use the right employee involvement survey, 2. Focus on involvement at the local and organizational levels, 3. Select the right managers, 4. Coach managers and hold them accountable for their employees' involvement and 5. Define involvement goals in realistic, everyday terms.
24	**What are internal failure costs?** These are costs required to identify, repair, replace, or dispose off defective products/services prior to delivery to the customer.
25.	**Write the requirements of reliable supplier rating. (Nov/Dec 2016)** Supplier rating system requires 3 key factors: 1. An internal structure to implement and sustain the rating program, 2. A regular and formal review process and 3. A standard measurement system for all suppliers.

26.	**List any four benefits of employee involvement. (April/May 2016)** Conformance, Acceptance, Contribution, Commitment, Cooperation, Accountability and ownership.
27.	**Why team and teamwork are required in TQM? (April/May 2017)** Teams are formed when individuals with a common preference, liking, and attitude come and work together for a common goal. Teams play a very important role in organizations. Team work is essential in corporate for better output and a better bonding among employees.
28.	**Define Leadership. (Jan/Feb 2022).** Leadership is the ability of an individual or a group of individuals to influence and guide followers or other members of an organization. Leadership involves making sound and sometimes difficult decisions, creating and articulating a clear vision, establishing achievable goals and providing followers with the knowledge and tools necessary to achieve those goals.
29.	**What are the benefits and drawbacks of sourcing a component or accessories? (Jan/Feb 2022)** There are many advantages to understanding the importance of sourcing a component 1. **Cheap Manpower** 2. **Scalability** 3. **Accessibility** Drawbacks 1. **Quality Loss** 2. **Intellectual Loss** 3. **Job loss**
30	**Define the characteristics of a leader. (NOV/DEC 2011,MAY/JUNE 2013)** 1. The customers first, 2. Value people, 3. Build supplier partnership, 4. Empower people, 5. Demonstrate involvement/ Commitment, 6. Strive for excellence 7. Explain and deploy policy, 8. Improve communication, 9. Promote teamwork, 11. Benchmark continuously, 12. Encourage collaboration.
31	**List the various styles of effective leaders.** 1. Directing Style of leadership 2. Consulative style of leadership

	3. Participative style of leadership 4. Delegating style of leadership
32	**Define Motivation.** Motivation means a process of stimulating people to accomplish desired goals. Motivation is the process of attempting to influence others to do your will through the possibility of reward. Motivation is the process of inducing people inner drives and action towards certain goals and committing their energies to achieve these goals.
33	**State Maslow's Hierarchy of Needs.** Physiological needs□□Safety□□Social□□Esteem□□Self-actualization
34	**State Frederick Herzberg's Two-factor theory?** Herzberg found that people were motivated by recognition, responsibility, achievement and the work itself.
35	**Define team.** A team can be defined as a group of people working together to achieve common objectives or goals.
306	**What is performance appraisal**? Performance appraisal is a systematic and objective assessment or evaluation of performance and contribution of an individual.
37	**What are the benefits of performance appraisal?** • It provides useful feedback to the employee, supervisor and personnel specialists and allows them to take corrective measures to improve performance further. • It helps in determining the pay adjustments, increments and bonuses as it rates the merit of the employee • It provides basis for employee promotion, transfer or demotion. • It helps the employee to plan their career.
38	**What are the types of quality problems?** Compliance problems, Unstructured problems, Efficiency problems, Process Design problems, Product- design problems
40	**What are the steps in the PDSA cycle?** The basic Plan-Do-Study-Act is an effective improvement technique.

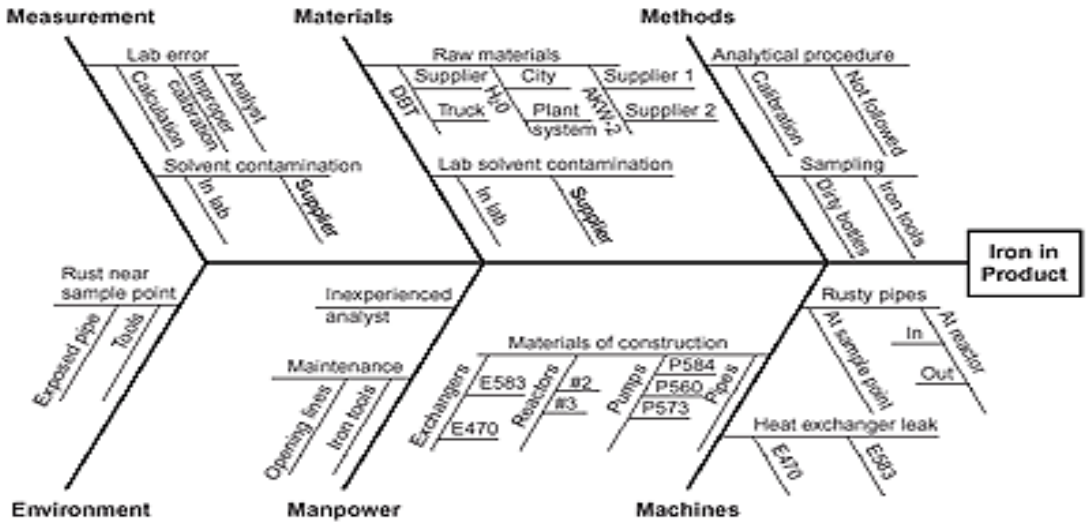
	• Plan carefully what is to be done • Carry out the plan • Study the results Act on the results by identifying what worked as planned and what didn't.
41	**What are the benefits of PDSA cycle?** Daily routine management- for the individual and /or the team, Problem solving process, Project management, Continuous development, Vendor development, Human resources development, New product development Process trials.
42	**What are the phases of a Continuous Process Improvement Cycle?** Identify the opportunity, Analyze the process, Develop the optimal solutions, Implement, Study the results, Standardize the solution, Plan for the future.
43	**Define supplier partnering. NOV/DEC 2014** Partnering is defined as a continuing relationship between a buying firm and supplying firm, involving a commitment over an extended time period, an exchange of information, and acknowledgement of the risks and rewards of the relationship.
44	**List the responsibilities of the Quality council coordinator.** • To develop two way trust • To propose team requirements to the council • To share council expectations with the team • To empower the team • To brief the council on team progress.
	PART – B
1	**Write a note on quality planning and strategic quality planning. (April/May 2014; Nov/Dec 2016**)
2	**Explain the different types of teams. (Nov/Dec 2011)**
3	**Explain all the elements in 5'S principle and also the implantation procedure of 5'S in a manufacturing company. / Elaborate the Japanese 5s as applicable to services. (Nov/Dec 2011; Nov/Dec 2017)**
4	**Give detailed notes about quality circle. / Explain about structure of quality circle and quality circle tools.**

5	**Write about the system of recognition and reward followed in an organization. (Nov/Dec 2011)**
6	**What are the steps involved in continuous improvement process. (Nov/Dec 2011)**
7	**List the five levels in Maslow's hierarchy of needs and describe in detail each level.**
8	**What are the characteristics of empowered employee? And also discuss the benefits of empowered environment.**
9	**Explain in detail the concept of employee involvement.**
10	**Write short note on: (i) supplier partnership, (ii) partnering, (iii) supplier selection and (iv) supplier rating. (Nov/Dec 2016)**
11	**Differentiate quality control and quality testing department of an organization. (Jan/Feb 2022)**
12	**Explain the concepts of Leadership? (MAY/JUNE 2014.)**
13	**Explain McGregors theory X and theory Y? (May 2017).**
14	**Explain Juran's Trilogy in detail. June/ July 2021.**
	PART – C
15	**Discuss how quality council is structured in (i) university academic department and (ii) manufacturing facility. (April/May 2016)**
16	**(i) Explain the phases of PDSA cycle and its illustration. (April/May 2016) / Give a detailed note on PDCA cycle. (Nov/Dec 2016)** **(ii) What is 5S and why does the organization adopt this technique? (April/May 2016)**
17	**Portray the characteristics of empowered employees. (Nov/Dec 2016)**
18	**Enumerate the duties of quality council. / Discuss the role and contributions of quality council. (April/May 2017; Nov/Dec 2017, Jan/Feb 2022)**
19	**List out the possible kaizen activities can be applied in your house. Explain each case separately. (for example: corridor, kitchen, water tank, drawing room, fortigo, vehicle parking shed, rest room etc). Jan/Feb 2022**

UNIT III TQM TOOLS AND TECHNIQUES I 9

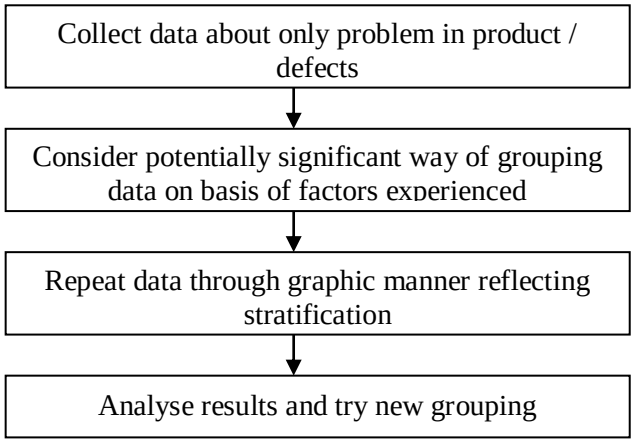
The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology,

applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.	
PART – A	
1	**List the seven tools of quality.** 1. Check sheets, 2. Histograms, 3. Cause and effect diagrams, 4. Pareto diagrams, 5. Stratification analysis, 6. Scatter diagrams and 7. Control charts.
2	**What is check sheet?** A check sheet or tally sheet is a form for systematic data gathering and registering to get a clear view of the facts.
3	**When do you use the check sheet?** A check sheet is used to indicate the frequency of a certain occurrence.
4	**What are the types of check sheets commonly used? (April/May 2016)** 1. Process distribution check sheet, 2. Defective item check sheet, 3. Defect location check sheet and 4. Defect factor check sheet.
5	**Write the different concepts of six sigma. (April/May 2017; Nov/Dec 2017)** Six sigma is similar to Zero Defects (ZD), is a philosophical benchmark or standard of excellence proposed by Philip Crosby. Six sigma strives for perfection. It allows for only 3.4 defects per million opportunities (or 99.99966 percent accuracy).
6	**What is histogram? When do you use histogram?** A histogram is a bar chart / diagram showing a distribution of variable quantities or characteristics. It is graphical display of the frequency distribution of numerical data. A histogram is used to show clearly where the most frequently occurring values are located and the data is distributed. It enables the analyst to quickly visualize the features of a complete set of data.
7	**What is meant by bench marking? (Nov/Dec 2016, Jan/Feb 2022)** A measurement of the quality of an organization's policies, products, programs, strategies, etc., and their comparison with standard measurements, or similar measurements of its peers.
8	**How to use cause and effect diagram. (Nov/Dec 2016)** The cause and effect diagram or Fishbone diagram is a graphical-tabular chart to list and analyze the potential causes of a given problem. It can be used (i) When identifying possible causes for a problem and (ii) When a team tends

	to fall into ruts. 
9	**Under what situations, one can use cause and effect diagram?** The cause and effect diagram has unlimited application in research manufacturing, marketing, office operations, services, etc.
10	**What are the uses of CE diagram?** The cause and effect diagrams are used: 1. to analyse cause and effect relationships, 2. to facilitate the search for solutions of related problems, 3. to standardize existing and proposed operations and 4. to educate and train personnel in decision-making and corrective action activities.
11	**What are the various types of histogram?** 1. Bell-shaped, 2. Double-peaked, 3. Plateau, 4. Comb, 5. Skewed, 6. Truncated, 7. Isolated peak and 8. Edged peak.
12	**What is pareto diagram? State the pareto principle. (Jan/Feb 2022)** A pareto diagram is a diagnostic tool commonly used for separating the vital few causes that account for a dominant share of quality loss. Pareto principle states that a few of the defects accounts for most of the effects.
13	**What are the purposes of pareto principle?** Pareto analysis can be used in a wide range of situations, where one need to priorities problems based on its relative importance.
14	**What is stratification?** Pareto analysis can be used in a wide range of situations, where one need to priorities problems based on its relative importance.

15	**What is scatter diagram?** The scatter diagram is a simple graphical device to depict the relationship between two variables.
16	**When do you use the scatter diagram?** The purpose of the scatter diagram is to display what happens to one variable when another variable is changed.
17	**Define statistics applications of statistical techniques.** Statistics is defined as the science that deals with the collection, tabulation, analysis, interpretation and presentation of quantitative data.
18	**What are major functions of statistical analysis? Write down the applications of statistical techniques.** The major functions of statistical analysis are: 1. reducing the complexity of the situation, 2. making comparisons and drawing conclusions, 3. estimating and predicating, and Decision-making. Statistical techniques are applicable in all situations where quantification is possible. The statistical analysis has become indispensable to practically every field that exists.
19	**What are the types of graphs used in representing frequency distribution?** Histogram, Frequency polygon and frequency curve, and Cumulative frequency or the 'Ogive'.
20	**How do obtain frequency curve?** A frequency curve is obtained by drawing a smooth freehand curve through the points of the frequency polygon. The cumulative frequency curve (also called an Ogive) obtained by plotting upper class limits (or lower class limits) against the 'less than' (or 'more than') cumulative frequencies is known as 'less than' Ogive (or 'more than' Ogive).
21	**What do you mean by measure of central tendency? What are the three measures of central tendency?** A measure of central tendency of a distribution is a numerical value that describes the central position of the data. Three measures of central tendency are 1. Mean, 2. Median and 3. Mode.
22	**What are the three measures of dispersion?** Measures of dispersion tell us how the individual observations are spread on either side of the center.

	1. Range, 2. Mean deviation and 3. Standard deviation.
23	**What is meant by attribute? What is the use of control charts for attributes?** 1. An attribute refers to those quality characteristics that confirm to specifications or do not conform to specifications. 2. Control charts for attributes monitor the number of defects or fraction defects or fraction defect rate present in the sample. 3. p chart: The chart for fraction rejected as non-conforming to specification 4. np chart: The control chart for number of non-conforming items. 5. c chart: The control chart for number of defects. 6. u chart: The control chart for number of defects per unit.
24	**Define fraction defective (p).** It is defined as the ratio of the number of defective articles found in any inspection to the total number of articles actually inspected. Mathematically, **P = np/n** Where, P= Fraction defective, np = Number of defectives, and n = Number of items inspected in the sub-group
25	**Write the specific use of np chart. (Nov/Dec 2016)** Np-charts are used to determine if the process is stable and predictable, as well as to monitor the effects of process improvement theories.
26	**Write down the difference between a defect and defective.** An item is said to be defective if it fails to conform to the specifications in any of the characteristics. Each characteristics that does not meet the specifications is called defect. For example, if a casting contains undesirable hard sports, below holes, etc., the casting is defective and the hard spots, below holes, etc., are the defects.
27	**Differentiate between producer's risk and consumer's risk.** Producer's risk: It is the probability of rejecting a good lot which otherwise would have been accepted. Consumer's risk: It is the probability of accepting a defective lot which otherwise would have been rejected.
28	**What are the five phases in six sigma process?** The five phases in six sigma process are: 1. Define, 2. Measure, 3. Analyze, 4. Improve and 5. Control
29	**Brief the scope of six sigma principle.** The six sigma concept is originated from manufacturing field. Now it is applied to non-

	manufacturing processes also. Today one can apply six sigma to many fields such as services, medical and insurance procedures, call centres, etc.
30	**What are the types of check sheets commonly used?** 1. Process distribution check sheet, 2. Defective item check sheet, 3. Defect location check sheet and 4. Defect factor check sheet.
31	**State the primary objectives of six sigma. (April/May 2017)** The primary objective of six sigma is to reduce the process variability σ (standard deviation) from the target (mean μ).
32	**Mention the use of Stratification chart in TQM. (April/May 2017)** Stratification chart is a used for data analysis. When data from variety of sources have been lumped together this chart separates the data so that patterns can be seen. Stratification is a method of analysis of data by grouping it in different ways. It is a simple, very effective QC tool for improving the quality. 
33	**Define flow chart.** • A flow chart, also known as process flow chart, flow diagram and process deployment flow, is a diagrammatic view of the various steps in sequential order that form an overall process in an organization. • Flow charts are used in the quality management for depicting the steps of a process inan easily understandable form, by using standard symbols.
34	**Define control chart.** A control chart is a graph that displays data taken over time and the variations of this data. A control chart illustrates the dynamic performance of the process. This is based on a series of random samples taken at regular intervals.

35	**What are the new seven management tools? June/July 2021.** i. Affinity Diagram ii. Interrelationship Digraph (or) Relationship diagram iii. Tree Diagram iv. Matrix Diagram v. Prioritization Matrices (or) Matrix data analysis vi. Process Decision Program Chart (or) decision tree vii. Activity Network diagram (or) Arrow diagram
36	**Define Affinity diagram.** An affinity diagram is a tool to collect a large amount of verbal expressions and organize then in according to natural relationship between individual items. This diagram is also referred to as a KJ diagram after its inventor Jiro Kawakita. This is a special kind of brainstorming tool.
37	**Define relationship diagram.** Relationship diagram is a tool for finding causes to a problem. The basic logic behind thetool is the same as those of the cause and effect diagram. This diagram not only clarifies the relationship between cause and effect but also between the various causes. It is a graphical representation of all factors in a complicated problem, system or situation.
38	**Define tree diagram.** A tree diagram systematically breaks down a topic into its components elements and shows the logical and sequential links between these elements. The tree diagram systematically outlines the complete spectrum of paths and tasks that must be carried out to achieve a goal.
39	**Define Matrix diagram.** A matrix diagram is a tool that is used to systematically organize information that must be compared on a variety of characteristics in order to make a comparison, selection or choice. It is a tool which the relations between two sets of factors in the form of a table ora matrix. Matrix diagram, sometimes referred as a "quality table", is the starting point in building a "house of quality".
40	**Define decision tree.** A Process Decision Programme Chart (PDPC), also known as decision tree, is aplanning tool to outline every conceivable and likely occurrence in any planning. The PDPC forces proactive thinking on what can go wrong with one's plan and

	whatwould one do to overcome the effect of such adverse occurrences.
41	**Define Arrow diagram.** An arrow diagram is a graphic description of the sequential steps that must be completed before a project can be completed. The PERT (Program Evaluation and Review Technique) and CPM (Critical Path Method) charts are the best known arrow diagram. It is a planning tool that determines the critical path of a process or a project.
42	**List the benefits and pitfalls of Benchmarking.** **Benefits:** • Creating a culture that values continuous improvement to achieve excellence. • Sharing the best practices between benchmarking partners • Prioritizing the areas that need improvement. • Enhancing creativity by devaluing the not-invented-here syndrome. • Increasing sensitivity to changes in the external environment. **Pitfalls:** • This is based on learning from others, rather than developing new and improvedapproaches. • Benchmarking should not be a substitute for innovation. • It must be a mere improvement tool.
43	**What is FMEA? NOV/DEC 2013** Failure and Effect Analysis, also known as Risk analysis, is a preventive measure to systematically display the causes, effects and possible actions regarding observed failures. The objective of FMEA is to anticipate failures and prevent them from occurring. FMEA prioritises failures and attempts to eliminate their causes.
44	**List some of the benefits of FMEA.** • Improve Product/ Process reliability and quality. • Increase customer satisfaction • Early identification and elimination of potential product/process failure modes. • Prioritize Product/Process deficiencies. • Capture engineering/organization knowledge • Document and track the actions taken to reduce risk. • Provide focus for improved testing and development.

	• Minimize late changes and associated cost. • Act as catalyst for teamwork and idea exchange between functions.
45	**What are the reasons for the benchmarking? MAY/JUNE 2013,MAY/JUNE2014** • It aims at a goal setting process to facilitate comparison with the best. • It aims at motivating and stimulating company employees towards the goal of continuous quality improvement. • It aims at external orientation of the company. • It aims at identifying a technological breakthrough. • It aims at searching for industry best practices.
	PART – B
1	**What is six sigma concept? How can it be effective in a service organization? (Nov/Dec 2016)**
2	**Define histogram. Mention its types. Illustrate with an example. / Discuss about types of histograms and their interpretations.**
3	**Explain the cause and effect diagram (or) fishbone diagram.**
4	**Define pareto diagram. Explain how to construct it? Also explain the stratification analysis.** **What is it?**
5	**Define the scatter diagram. Mention its types. What is it?**
6	**Explain briefly about check sheet (or) data collection sheet with an example.**
7	**Explain the New Seven Management Tools? MAY/JUNE 2013, NOV/DEC 2013,MAY/JUNE 2014, NOV/DEC 2014,MAY/JUNE 2016 , NOV/DEC 2016,June/July 2021.**
8	**What is bench marking? Explain its Types (Jan/Feb 2022).**
9	**Why bench marking is required in an organization? Write down the general procedure for bench marking process. (Jan/Feb 2022)**
10	**Explain the failure mode and effect analysis (FMEA). (Nov/Dec 2016; Nov/Dec 2017, Jan/Feb 2022)**
11	**Compare six sigma and TQM concepts.**
	PART – C
12	**What benefits have been achieved by the organization that has been successfully**

	completed their benchmarking programs? Name any four best practiced companies. (Nov/Dec 2016)
13	**List out the different situations where FMEA is to be carried out. Give detailed FMEA procedure. (April/May 2017, Jan/Feb 2022)**
14	**Perform an FMEA to anticipate various problem faced and method to eliminate the problem of getting up from bed in the morning and going to school. (April/May 2016)**

UNIT IV TQM TOOLS AND TECHNIQUES II 9

Quality Circles - Cost of Quality - Quality Function Deployment (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.

PART – A

1.	**List the objectives of TPM programme.** The overall goals of TPM are: Maintaining and improving equipment capacity. Maintaining equipment for life. Using support from all areas of operation. Encouraging inputs from all employees. Using teams for continuous improvement.
2.	**What is product life characteristics curve?** The failure rate curve, called the product life characteristics curve, shows the failure rates (failures per unit time) against time. It is also called as bathtub curve because of its shape.
3.	**What are the three stages shown on a product life characteristics curve?** The curve consists of three distinct stages: Early failure (‘infant mortality’ or ‘debug’), useful life (‘normal failure’ or ‘chance’) and wear out (‘old age’) failure. The curve shows that the failure rates are higher at the early and end stages of a product’s life and relatively low in between the two extremes.
4.	**What is the usefulness of the product life characteristics curve?** Knowing the product life characteristics curve for a particular product helps engineers predict failure behavior and take suitable decisions.
5.	**What is the essential feature of Total Productive Maintenance (TPM)?** TPM is keeping plant and equipment at their highest productive level through cooperation of all areas of the enterprise. TPM brings maintenance into focus as a necessary and vital part of the business. It is not regarded as a non-profit activity. Down time for maintenance is scheduled as an integral part of the manufacturing process.
6.	**What are the various approaches to improving reliability of a product?** Standardization, redundancy, over-design, de-rating, design simplification, understanding the physics of failure, burn-in, and Failure Mode and Effect Analysis (FMEA).

7.	**What are the different ways of classifying maintenance activities?** Maintenance activities can be classified in various ways: 1. Planned (or preventive) maintenance vs. Unplanned (or breakdown) maintenance 2. Preventive maintenance can be sub-classified into periodic maintenance and predictive maintenance 3. Running maintenance vs. Shutdown maintenance 4. Time-based maintenance vs. Condition-based maintenance
8.	**What is some performance measures used to assess the success of TPM?** Mean Time Between Failures (MTBF), Mean Time To Repair (MTTR), Availability (A), Reliability (R), Maintainability (M), Rate efficiency (RE), Speed efficiency (SE), Performance efficiency (PE), Quality rate (Q), and Overall Equipment Efficiency (OEE).
9.	**What are the three categories of losses identified in TPM?** 1. Losses that impede equipment efficiency, 2. Losses that impede human work efficiency and 3. Losses that impede effective use of production resources.
10.	**What are the eight pillars of TPM?** The eight pillars of TPM are: 1. 5S, 2. Jishu Hozen (Autonomous Maintenance), 3. Kobetsu Kaizen (KK), 4. Planned Maintenance (PM), 5. Quality Maintenance (QM), 6. Training, 7. Office TPM and 8. Safety, Health and Environment.
11.	**What is office TPM?** Office TPM is aimed at improving quality, productivity and efficiency in the administrative functions and identifying and eliminating losses.
12.	**Distinguish between Kaizen.** Kaizen involves incremental improvements, whereas Business Process Reengineering involves breakthrough improvements. Both are essential for successful implementation of TQM.
13.	**What is quality loss?** This loss includes costs to operate, failure to function, maintenance and repair costs, customer dissatisfaction injuries caused by poor design and similar costs.
14.	**What is QFD?** Quality function development may be defined as a system for translating consumer requirements into appropriate requirements at every stage, from research through product design and development, to manufacture, distribution, installation and marketing, sales and

	service.
15.	**What is control chart? List the types of control charts. (Nov/Dec 2017)** A control chart is a graph that displays data taken over time and the variation of this data. Control charts for variables – for measurable data such as time, length, temperature, weight, pressure, etc. Control charts for characteristics- for quantifiable data such as number of defects, typing errors in a report, etc.
16.	**When do you use control chart?** The purpose of control chart is to identify when the process has gone out of statistical control, thus signaling the need for some corrective action to be taken.
17.	**What is external failure costs? June/July 2021.** External failure costs arise from the rejection of the products/ services by the customers due to poor quality. The external failure costs are tests that occur when non conforming product or service reaches the customer. These costs are associated with the adjustments of malfunctions after delivery of the product, such as: repair costs, travel and lodging expenses, replacement costs, stock spare parts, lost goodwill of customer, guarantee and warranty costs and dispatchment costs.
18.	**What are the performance measures of TQM?** Customer orientation, value based operations, performance compatibility, teamwork, development and monitoring**.**
19.	**What is meant by process capability? (April/May 2016)** Process capability may be defined as the "minimum spread of a specific measurement variation which will include 99.7% of the measurements from the given process". Process capability=6σ. Since 99.7% area in the normal curve is between -3σ and +3σ.
20.	**What are the benefits of TPM? (or) List out the benefits of total productive maintenance. (April/May 2016; April/May 2017)** Increased equipment productivity, Improvement equipment reliability, Reduced equipment downtime, Increased plant capacity, Extended machine time, Lower maintenance and production costs, Approaching zero equipment-caused defects, Improved team work between operators and maintenance people, Enhanced job satisfaction, Improved return on investment,

	Improved safety.
21.	**Define process capability index. (Nov/Dec 2016)** The process capability index or process capability ratio is a statistical measure of process capability; the ability of a process to produce output within specification limits. The concept of process capability only holds meaning for processes that are in a state of statistical control. Process capability indices measure how much "natural variation" a process experiences relative to its specification limits and allows different processes to be compared with respect to how well an organization controls them.
22.	**Write down the various stages of FMEA. (April/May 2016; Nov/Dec 2017))** The FMEA methodology has four stages. They are: Stage1: Specifying possibilities, Stage2: Quantifying risk, Stage3: Correcting high risk causes and Stage4: Re-evaluation of risks.
23.	**What is house for Quality?** • The primary planning tool used in QFD is the House of Quality (HOQ). • The House of Quality converts the voice of the customer into product design characteristics. • QFD uses a series of matrix diagrams, also called, "quality tables" that resemblesconnected houses.
24.	**What are the objectives of performance measures?** • Establish Baseline measures and reveal trends • Determine which processes need to be improved • Indicate process gains and losses. • Compare goals with actual performance • Provide information for individual and team evaluation • Provide information to make informed decision Determine the overall performance of the organization.

25.	**What is a QFD? NOV/DEC 2018** Quality Function Deployment is a planning tool used to fulfill customer expectations. It isa disciplined approach to product design, engineering, and production and provides in- depth evaluation of a product. QFD may be defined as a system for translating customer requirements into appropriate requirements at every stage, from research through product design and development, to manufacture, distribution, installation and marketing, sales and service.
26.	**How will you Construct a house of quality? (or) QFD Methodology.** a) List customer requirements b) List technical descriptors c) Develop a relationship matrix between WHATs and HOWs d) Develop an interrelationship matrix between HOWs e) Competitive assessments f) Develop prioritized customer requirements g) Develop prioritized technical descriptors
27.	**List the users of QFD**. • Currently many U.S. and Japan companies are using QFD. • In the automobile industry, Ford, Chrysler, and General Motors are users of QFD. • In the electronics field, Digital Equipment Corporation and Texas instruments havebeen QFD pioneers. • Numerous other companies use QFD including : Procter & Gamble, Deere & company, The Kendall Company, Polaroid, Rockwell International, Hughes Aircraft, and Hewlett-Packard.
28.	**Define Taguchi method.** Taguchi methods are statistical methods developed largely by Genichi Taguchi to improve the quality of manufactured goods.
29.	**Define Taguchi Loss function. NOV/DEC 2012, MAY/JUNE 2015** Taguchi defines quality as" the loss imparted by the product to society from the time the product is shipped. The essence of the loss function concept is that whenever a product deviates from its target performance, it generates a loss to society.

30.	**Write the formula for Taguchi's QLF.** **Taguchi's QLF:** $L(x)= k(x-N)^2$ $k= C/d^2$ Where L(x) = Loss functionk= Constant of proportionality x= Quality characteristics of selected product N= Nominal value of the chosen productC= Loss associated with the specification limit d = Deviation of the specification from the target value
31.	**Define maintenance.** Maintenance is defined as the management, control, execution and quality assurance of activities which ensure the achievement of optimum availability and performance of a plant in order to meet business objectives.
32.	**List the types of maintenance.** • Corrective or breakdown maintenance • Scheduled or routine maintenance • Preventive maintenance • Predictive maintenance
33.	**Write down the formula of OEE (Overall Equipment Effectiveness) NOV/DEC 2011** Overall Equipment Effectiveness (OEE)= Availability * { Performance efficiency}*{ Rate of Quality Products}
34.	**What are the objectives of quality circles? or what are the functions of quality circles? MAY/JUNE 2013, NOV/DEC 2013** **Objectives:** • To promote job involvement • To create problem solving capability. • To improve communication • To promote leadership qualities. • To promote personal development • To develop a greater awareness for cleanliness. • To develop a greater awareness for safety • To reduce errors. • To enhance quality.

	• To inspire more effective team work. • To build an attitude of problem prevention.
	PART – B
1	**Explain control chart (or) Shewhart chart. / Explain with an example of any three control charts. (April/May 2016; Nov/Dec 2016)**
2	**Compare the variable charts and attribute charts.**
3	**Briefly outline the six sigma DMAIC process.**
4	**Briefly explain the steps involved in QFD. (Nov/Dec 2010; April/May 2016)**
5	**Explain each section of the basic structures of house of quality. (Apr/May 2010) / Explain in detail about the structure of house of quality. (April/May 2014; Nov/Dec 2016)**
6	**Discuss objectives of quality function deployment.**
7	**Highlight the benefits of QFD. (Apr /May 2010; Nov/Dec 2016)**
8	**Explain about Taguchi's quadratic quality loss function. How it differs from traditional approach of quality loss cost? (April/May 2013)**
9	**(i) The Taguchi loss function for a certain component is given by $L(X) = 7500 (X-N)^2$, where X = the actual value of a critical dimension and N is its Nominal value. Company Management has decided that the maximum loss that can be accepted is Rs. 400. If the nominal dimension is 35.00 mm, find the tolerance limits.** **(ii) Explain the concept of signal to noise ratio. (Nov/Dec 2017)**
10	**Explain Total Productive Maintenance (TPM) with case study / What is Total Productive Maintenance (TPM)? / Discuss the concepts of TPM. (Nov/Dec 2017)**
	PART – C
11	**Devise a QFD methodology for design and development of cups used in vending machine for dispersing hot and cold beverages. (April/May 2016, Jan/Feb 2022)**
12	**Write down the objectives of implementing total productive maintenance. Discuss about the core elements of TPM program. Compare TQM and TPM. (April/May 2017; Nov/Dec 2017, Jan/Feb 2022)** **(or)** **Explain in detail about the 8 pillars of TPM.**
13	**(i) List out the benefits of performance measure. (April/May 2017)**

	(ii) Briefly explain the DMAIC procedure
14	**Draw the quality function deployment QFD diagram for comparing an education institution in comparison with competing institution by referring various quality assessment parameters. (Jan/Feb 2022)**

UNIT V QUALITY MANAGEMENT SYSTEM 9

Introduction—Benefits of ISO Registration—ISO 9000 Series of Standards—Sector-Specific Standards—AS 9100, TS16949 and TL 9000-- ISO 9001 Requirements—Implementation—Documentation—Internal Audits—Registration--**ENVIRONMENTAL MANAGEMENT SYSTEM:** Introduction—ISO 14000 Series Standards—Concepts of ISO 14001—Requirements of ISO 14001—Benefits of EMS.

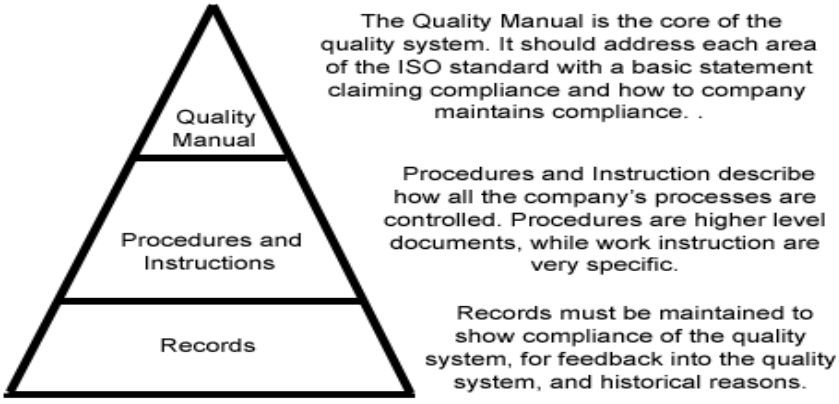
PART – A

1	**What is the concept of Environment Management System (EMS)?** **What is meant by environmental policy? (Jan/Feb 2022)** 1. An EMS meeting the requirements of ISO 14001:2004 is a management tool enabling an organization of any size or type to: 2. Identify and control the environmental impact of its activities, products or services, and to 3. Improve its environmental performance continually, and to 4. Implement a systematic approach to setting environmental objectives and targets,to achieving these and to demonstrating that they have been achieved
2	**What are ISO 9000 quality standards?** ISO 9000 are a set of quality standards aimed at promoting the growth of international trade by facilitating harmonious interactions between suppliers and customers located in diverse locations globally. It is a quality management system [QMS] to ensure quality of products and services.
3	**Write about documentation pyramid.** **Tier 1 - Quality manual** The top tier is the quality manual, which contains: • Statements about management's commitment to quality • Quality Policies • Information about responsibilities for quality related processes • It should also contain a list of tier-2 quality documents and how to locate them. • The manual also may contain high-level information about key areas of the quality system like documentation and design control. **Tier 2 - Procedures and instructions**

	Tier-2 of the ISO 9001:2008 Documentation pyramid is the bulk of the quality procedures, standard operating procedures (SOPs), work instructions and explains detailed responsibilities for process control. **Tier 3 - Quality records** Tier-3 consists of quality records. Most of the quality records are generated based on tier-2 procedures. Quality records include customer specifications, order processing paperwork or records, incoming inspection records, and product test results
4	**Define quality management systems.** Quality management systems are the organizational structures, responsibilities, processes, procedures, and resources used for implementing quality.
5	**What are the quality function needs served by the computer?** 1. Data collection, 2. Data analysis and reporting, 3. Statistical analysis, 4. Process control, 5. Test and inspection and 6. System design
6	**What are the different types of documents found in ISO 9000?** 1. Quality Policy Manual (What? Why?), 2. Quality System Procedures (Who? When? Where?), 3. Work Instructions (How?) and 4. Records, formats and forms (Evidence).
7	**What are the eight quality principles underlying ISO 9000:2000?** 1. Customer focus, 2. Leadership, 3. Involvement of people, 4. Process approach, 5. System approach to management, 6. Continuous improvement, 7. Decisions based on facts and 8. Mutually beneficial supplier relationships.
8	**Define quality system audit. (Nov/Dec 2017)** Quality system audits is a systematic, independent examination to determine whether quality activities and results comply with planned arrangements, whether these arrangements are implemented effectively, and whether these are suitable to achieve objectives.
9	**What are the different types of audit?** First party audit (internal), Second party audit (by customer), and Third party audit (by independent agency). Another classification: System audit, Process audit, Product audit, Adequacy audit, and Compliance audit

10	**What are the different stages in conducting quality audit?** 1. Audit planning – schedules, personnel, notifications, checklist. 2. Performance – opening meetings, audit process, noting of non-conformities. 3. Reporting – Observations, suggestions for corrective action 4. Follow-up – implementation of corrective action.
11	**Give any five elements of ISO 9000.** 1. Management responsibility, 2. Quality system, 3. Contract review, 4. Design control, 5. Document control, 6. Purchasing, 7. Purchaser supplied product, 8. Product identification and traceability, 9. Process control and 10.Inspection & testing.
12	**Give the objectives of internal audit.** 1. Determine the actual performance conforms to the documented quality systems. 2. Initiate corrective action activities in response to deficiencies. 3. Follow up on noncompliance items of previous audits. 4. Provide continued improvement in the system through feedback to management.
13	**What are the uses of ISO standards?** 1. Fewer on-site audit by customers, 2. Increased market share, 3. Improved quality, both internally and externally, 4. Improve product and service quality levels from suppliers, 5. Greater awareness of quality by employees, 6. A documented formal systems and 7. Reduced operating costs.
14	**Explain the management's responsibility for ISO.** Top management shall provide evidence of its commitment to the development and implementation of the quality management system and continually improving its effectiveness by 1. Communicating to the organization the importance of meeting customer as well as statutory and regulatory 2. Requirements, establishing the quality policy, 3. Ensuring that quality objectives are established, 4. Conducting management reviews, and 5. Ensuring the availability of resources.
15	**What is the need for ISO standards? (Nov/Dec 2017)** ISO 9000 is needed to unify the quality terms and definitions used by industrialized nations and use terms to demonstrate a supplier's capability of controlling its processes.

16	**What is third party audit?** The third party certification audit is carried out much in the same way as first party and second party quality system assessments and audits. However, the big difference is that an independent accredited auditing body carries out the assessment and audit, as opposed to carrying it out by the organization themselves. Also note that the organization going for third party audits are responsible for the payment of the third party audit process.
17	**What are the documentation requirements of quality management systems?** The quality management system documentation shall include: 1. Documented statements of a quality policy and quality objectives, 2. A quality manual, 3. Documented procedures and records required by this International Standard and 4. Documents, including records, determined by the organization to be necessary to ensure the effective planning, operation and control of its processes.
18	**What are the requirements of ISO 14001?** 1. General requirements, 2. Environmental policy, 3. Planning. 4. Implementation and operation and 5. Checking and corrective action and 6.Management review.
19	**What are the benefits of ISO 14001?** 1. Facilitate trade and remove trade barriers, 2. Improve environmental performance of planet earth and 3. Build consensus that there is a need for environment management and a common terminology for EMS.
20	**What are the general requirements of quality management system?** The organization shall establish, document, implement and maintain a quality management system and continually improve its effectiveness in accordance with the requirements of this International Standard. The organization shall (a) determine the processes needed for the quality management system and their application throughout the organization, (b) determine the sequence and interaction of these processes, (c) determine criteria and methods needed to ensure that both the operation and control of these processes are effective, (d) ensure the availability of resources and information necessary to support the operation and monitoring of these processes,

	(e) monitor, measure (where applicable), and analyses these processes and (f) implement actions necessary to achieve planned results and continual improvement of these processes.
21	**What is quality manual?** The organization shall establish and maintain a quality manual that includes: 1. scope of the quality management system, including details of and justification for any exclusions, 2. The documented procedures established for the quality management system, or reference to them and 3. A description of the interaction between the processes of the quality management system.
22	**What are the benefits of ISO 14001?** 1. Facilitates trade and remove trade barriers, 2. Improves environmental performance of planet earth and 3. Builds consensus that there is a need for environment management and a common terminology for EMS.
23	**Name any two generic ISO standards. Why it is called generic standards? (Nov/Dec 2016)** ISO 9001 and ISO 14001 are generic standards. Generic means that the same standards can be applied: 1. To any organization, large or small, whatever its product or service, 2. In any sector of activity, and 3. Whether it is a business enterprise, a public administration, or a government department.
24	**Draw the documentation pyramid. (Nov/Dec 2011)**  The ISO 9001 Documentation Pyramid
25	**List down the main elements of ISO 14000. (April/May 2016)** 1. Environmental policy, 2. Environmental aspects, 3. Legal and other requirements, 4.

	Objectives and targets Environmental management program Structure and responsibility, 5. Training awareness and competence, 6. Communication, 7. EMS documentation, 8. Document control, 9. Operational control Emergency preparedness and response, 10. Monitoring and measurement and 11. Non-conformances and corrective and preventive.
26	**Write down the benefits of ISO 9000 certification. (April/May 2016)** Increased marketability, Reduced operational expenses, Better management control, Increased customer satisfaction, Improved internal communication, Improved customer service, Reduction of product-liability risks and Attractiveness to investors.
27	**What are the core elements of QMS? (Nov/Dec 2016)** 1. Quality Policy with quality objectives and KPIs 2. Quality Manual detailing management responsibilities, organizational chart, description of the company and what it does 3. Procedures – overview of specific parts of Nemesis Now operations – e.g. warehousing, sales etc. Should also include procedure for Non-conformities, corrective actions and preventive actions, and control of documents and records 4. Work instructions – detailed description of specific operations, such as completing a quote, invoicing, sales appointment etc. 5. Internal audit – periodic review of the Quality Management System and how it is being implemented, including a review of non-conformities 6. Management review – a review by senior management of the internal audit results and other quality data, including whether the KPIs have been achieved and any tends in data
28	**What are the important requirements of QS9000? (April/May 2017)** 1. Quality systems assessment guide, 2. Advanced product quality planning and control plan reference manual, 3. Production part approval process manual, 4. Measurement system analysis reference manual and 5. Fundamental statistical process control reference manual.
29	**Mention the different types of quality audits. (April/May 2017)** Quality auditing is done by both internal and external bodies. Based on the type of auditor, it is classified as: 1. First party audit, 2. Second party audit and 3. Third party audit It is also classified based on the area of coverage as: 1. System audit, 2. Process audit and 3. Product audit.

30	**Give the ISO 9000 Series of Standards?** ISO 9000, "Quality Management and Quality Assurance StandardsGuidelines for Selection and Use". ISO 9001, "Quality Systems - Model for Quality Assurance ISO 9002, "Quality Systems - "Model for Quality Assurance in Production, Installation & Servicing". ISO 9003, "Quality Systems - "Model for Quality Assurance in FinalInspection and Test". ISO 9004-1, "Quality Management and Quality System Elements - Guidelines".
31	**What is the objective of QS 9000?** To develop fundamental quality systems based on continuous improvement, direct prevention, reduction of variation and waste elimination in the automobiles supply chain.
32	**Differentiate between ISO 9000 and QS 9000.(Nov/Dec 2012)** **ISO 9000** has become an international reference for quality management requirements are being achieved in the delivered product. **QS 9000** is set of quality system requirements to help automotive suppliers to ensure that they are meeting/exceeding customer requirement.
33	**Compare QS 9000 with TS 16949 quality system** • Both are related to automotive quality system standards, now QS 9000 is being replaced by ISO /TS 16949 standards. • QS 9000 is basically product approach whereas TS 16949 is a processapproach. • The other difference between QS 9000 and ISO/TS 16949 relate to the aspectsof customer satisfaction and employee motivation • TS 16949 is much less focus on documentation and more focus on how the system is performing in achieving customer satisfaction
34	**What does it mean to be AS9100 certified?** AS9100 Certification Definition. AS9100 is a company level certification based on a standard published by the Society of Automotive Engineers (SAE) titled "Quality Systems-Aerospace Model for Quality Assurance in Design, Development, Production, Installation and Servicing".

35	**Define TL 9000.** TL 9000 is a quality management practice designed by the QuEST Forum in 1998. It was created to focus on supply chain directives throughout the international telecommunications industry, including the USA.
36	**What are the organizations are present to maintain and inspection of EMS.(Jan/Feb 2022)** **Organization standard** (i) Environmental Management system, (ii) Environmental Auditing (EA) and (iii) Environmental Performance Evaluation (EPE) **Product standard** (i) Environmental Aspects in product Standards(EAPS), (ii) Environmental Labels and Declaration(ELD),and (iii) Life Cycle Assessment(LCA)
	PART – B
1	**Explain documentation in quality standard.**
2	**Explain the requirements of ISO system to documentation. (April/May 2016)**
3	**Explain quality audits in detail. (Nov/Dec 2011)**
4	**List and explain the elements of ISO 9000 quality system. (April/May 2013; April/May 2014)**
5	**Discuss about implementation of ISO 9001. (Nov/Dec 2016)**
6	**Discuss the benefits of ISO 9000 certification. (April/May 2013)**
7	**Explain various divisions of ISO 14000 Standards. (Nov/Dec 2016).**
8	**Explain the major elements of environmental management system. (April/May 2014)**
9	**Explain the benefits of EMS. (Nov/Dec 2011)**
10	**Explain ISO 14000 standards and list the benefits. / What are the requirements, objectives and benefits of ISO 14000 system? (April/May 2016; Nov/Dec 2017, Jan/Feb 2022)**
11	**Discuss the implementation of AS 9100.**
12	**Discuss the implementation of TQM with a case study from the manufacturing industry. (Nov/Dec 2011) (Apr/May 2019, Jan/Feb 2022)**

	PART – C
11	**Discuss the need for standardization procedures for quality assurance. (April/May 2016)**
12	**Enumerate the various aspects of ISO 14000 environmental management system. Brief the various principles of ISO 14000 series. (April/May 2017)**
13	**Illustrate the detailed procedure for quality auditing. Brief the attributes of a good auditor. (April/May 2017)**
14	**Explain how each element of TQM contributes to products and services of superior quality. (Nov/Dec 2017)**