Name: **Enrolment No:**	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2018

Program: **MBA UISC** **Semester –** **III**

Subject (Course): Soft Infra & Quality Management **Max. Marks** **: 100**

Course Code **: PIUI 8001** **Duration** **: 3 Hrs**

No. of page/s: **13**

SECTION A
State True or False

S. No.		**CO**	**Marks**
1	If you want to improve a parameter, you need to first measure it. However, for parameters such as customer satisfaction this does not apply.	CO1	**2**
2	Quality can be improved through strengthening of inspection of finished products.	CO1	**2**
3	Cost of quality is the sum total of expenditure incurred in installing Total Quality management System in a business organization.	CO1	**2**
4	ISO-9001 is quality assurance system for manufacturing organizations only.	CO1	**2**
5	Fish bone diagram, pareto chart, control charts used for addressing quality in a manufacturing environment can not be used for addressing service quality.	CO1	**2**
6	Service recovery is a process of returning aggrieved/dissatisfied customers to a state of satisfaction.	CO1	**2**
7	A moment of truth is basically an instance wherein a manager recognises that a faulty product has been despatched to the customer.	CO1	**2**
8	Cpk < 0 indicates that the process has been set beyond either of the two specification limits.	CO1	**2**

9	An organization should benchmark with another orgnisation in the same class of industry/business.	CO1	**2**
10	Environmental performance of a company is a part of society results under EFQM excellence model.	CO1	**2**
	SECTION B **Attempt All Questions**		
1	Explain Concrete placing and Test.	CO3	**5**
2	Write short note on Fish Bone diagram.	CO2	**5**
3	How to assess quality performance of a SPV firm.	CO3	**5**
4	What are the major clauses in a standard bidding documents?	CO2	**5**
	SECTION-C **Attempt All**		
1	How will you assess quality performance of a city w.r.t to Smart City Mission, AMRUT & other urban development process	CO4	15
2	Explain the features of PMAY and role of alternative finance in it.	CO3	15
	SECTION-D		
1	**<u>SUNDARAM CLAYTON – WINNING THE DEMING PRIZE</u>** *The case examines the quality initiatives taken up by leading Indian air-brakes manufacturer, Sundaram Clayton to win the world's highest award for quality, the Deming Prize. The company's TQM experience and its preparation for winning the award are explored in detail. The case also provides information about the Deming Prize, its history, its importance and the parameters it is awarded on.* **"The Deming Prize is not just a recognition of product quality. It is the recognition of the organization itself. Clearly Sundaram-Clayton meets the requirements of a world-class company."** *"There are 3 things that Sundaram-Clayton illustrates. One, total quality is not a prerogative of Japanese companies. Two, Indian workers and managers are capable*	CO5	**30**

of international standards. And three, that neither size nor location matters in achieving world-class standards."

- Suresh Krishna, CEO, Sundaram Fasteners Ltd., in November 1998.

BACKGROUND NOTE

The leading manufacturer of air braking systems[1][1] in India, Sundaram Clayton Ltd. (SCL) is the flagship company of the US$1.6 billion TVS Group. Named after its founder, T.V. Sundaram Iyengar, the TVS Group began its journey with a small transport business in Chennai (India) in 1911. Over the years, the group diversified into two-wheelers, automotive components, automotive spares, computer peripherals and financial services. The group was particularly successful in its automotive component and two-wheeler businesses. In 2001, the TVS group had 29 globally recognized companies and an employee base of over 30,000.

SCL was established in 1962, in collaboration with UK-based Clayton Dewandre Holdings Plc. (renamed WABCO Automotive), a division of American Standards Inc. for manufacturing air-assisted and air-brake systems for commercial vehicles in India. Over the next few decades, SCL went on to become the principal supplier of air brake systems to the heavy and light commercial vehicle segments of the Indian automobile sector. The company was the original equipment manufacturer (OEM) for Ashok Leyland and Tata Engineering and Locomotive Company (Telco). Other major clients of the company included Hindustan Motors, Maruti Udyog and Bharat Earth Movers. OEM sales contributed 60% to the company's total sales while the replacement market accounted for an estimated 25%.

SCL used 65% of the castings produced by its foundry division and supplied the remaining (35%) to the group companies or other companies. The company's vast network of over 205 wholesale dealer outlets, situated across the country enabled it to become the leader in the automotive air brake systems market in India and garner a 70% marketshare. SCL has a full-fledged R&D center that enables design, development, simulation and testing processes of products. By focusing on R&D, the company was able to substitute its imports by its indigenously developed components.

SCL was also able to indigenously manufacture some components for the export markets. These initiatives were expected to help the company achieve its goal of becoming the leader in the automotive air braking business in Asia.

In spite of the slump in the automobile sector during the late 1990s, SCL registered improved revenues year after year between 1998 and 2000 (Refer Exhibit I for the company's financial performance summary). Industry analysts largely attributed the company's success to its focus on quality. According to TVS sources, the group as a whole had always aimed at competitiveness without compromising on quality. This belief was proved when the company adopted Total Quality Management (TQM)[2][2] in all its manufacturing companies, including SCL.

SCL followed the core principles of the TVS group – Quality, Reliability and Service. Quality measures at SCL were not only applicable to the product but also to systems, operations and processes at all levels of manufacturing. As a result of its company-wide quality control over the years, the company won the Deming Prize for CWQC (Company Wide Quality Control) in 1998. SCL was the first Indian company and the fourth non-Japanese company to receive the prize in the 50-year history of the award.

ABOUT THE DEMING PRIZE

One of the three highly recognized and coveted quality awards in the world,[3][3] the Deming Prize was established in Japan, in 1951, by the Union of Japanese Scientists and Engineers (JUSE). The award was instituted to recognize Dr. W E Deming's efforts (Dr. Deming)[4][4] to spread quality consciousness in Japanese companies and to encourage continued development of quality control in Japan (Refer Exhibit II for Dr. Deming's Maxims). The Deming Prize is the most difficult to qualify for as it involves a rigorous selection process and includes statistical quality control tools used from the lowest work level.

The Deming Prize had significant influence on the development of quality control in Japan, because companies that desired to win the award innovated new approaches to quality management that served their organizational requirements. These companies introduced effective quality management techniques, developed quality management models and implemented those concepts. Such quality initiatives and practices resulted in the overall development of these companies and made them successful. The success of these companies inspired many other companies to implement quality control techniques. Analysts remarked that the challenge to win the Deming Prize provided an excellent chance to learn and adopt effective quality control methodologies.

Categories in the Deming Prize included –

- The Deming Application Prize: Given to companies or divisions of companies, which achieved significant improvement in their performance through TQM in a given year. The members of the Deming application Prize sub-committee include quality control experts from the government, universities and non-profit organizations in Japan.
- The Deming Prize for Individuals: Given to individuals who made significant contributions to the study or propagation of TQM/ statistical techniques used for TQM. This award is open only to Japanese candidates.
- The Quality Control Award for Operations Business Units: Given to the operations divisions of companies that achieved significant improvement in performance through the application of quality control as a part of TQM initiatives in a given year.

Apart from these main categories there are two other awards given by the Deming Committee for quality control – Japan Quality Medal (for companies) and Quality Control Literature Prize (for individuals).

Since the Deming Prize was aimed at developing or improving of quality control activities in Japan, it was initially restricted to only Japanese companies. However, when non-Japanese companies expressed keen interest, the Deming Prize Committee opened the prize to non-Japanese companies in 1984.

The Deming Prize Committee is the authorized authority to select the winners of the Deming Prize. The Deming Prize Committee is chaired by a representative of JUSE, and comprises quality control experts from renowned universities and companies. The Deming Prize Committee appointed five sub-committees, for the five prizes, to

evaluate the applicants. These sub-committees evaluate the applicant companies/divisions on 10 parameters that cover every activity of the company/division. The Committee selects the winners in the respective categories, on the basis of the examination results submitted by the sub-committees (Refer Table I).

TABLE I

PARAMETERS OF DEMING PRIZE

ameters of Deming Prize include –

Top Management Leadership, Organizational Vision, and Strategies.
Total Quality Management (TQM) Frameworks: Organizational Structure and Operations, Daily Management, Policy Management, Relationship with ISO 9000 & I 14000, Relationship with Other Management Improvement Programs, TQM Promotion Operation.
Quality Assurance Systems: Quality Assurance System, New Product and New Technol Development, Process Control; Test, Quality Evaluation and Quality Audits, Activi Covering the Whole Life Cycle, Purchasing, Subcontracting and Distribution Managem
Management Systems for Business Elements: Cross-Functional Management and Operations, Quality/Delivery Management, Cost Management, Environme Management, Safety, Hygiene and Work Environment Management.
Human Resource Management: Positioning of 'People' in Management, Education Training,
Effective Utilization of Information: Effective use of available data in Managem Information Systems, Support for Analysis and Decision-Making, Standardization Configuration Management.
TQM Concepts and Values: Quality, Maintenance and Improvement, Respect for Human
Scientific Methods: Understanding and Utilization of Methods, Understanding Utilization of Problem-Solving Methods.
Organizational Powers: Core Technology, Speed, Vitality.
Contribution to Realization of Corporate Objectives: Customer Relations, Emplo Relations, Social Relations, Supplier Relations, Shareholders Relations; Realization Corporate Mission Continuously, Securing Profits.

Source: www.deming.org

However, the Deming Prize committee's examination process does not require the applicant companies adopt its specific quality control model to qualify for the Deming Prize. Instead of following a specific model, companies are expected to identify their requirements, establish their own goals and objectives, and conduct a CWQC program. For the Deming Prize, the performance of every division and function is graded separately, including the CEO's performance. The results of these quality control

mechanisms and their effectiveness, expected to help in future development of the company, form the major criteria for the award. The sub-committees evaluate companies/divisions on the basis of their ability to develop and utilize statistics-driven quality control techniques to produce reliable and cost-effective products or services that meet customer requirements.

The Deming Prize Committee conducts a comprehensive evaluation of the applicant companies, taking into consideration factors such as the applicant's attitude towards the implementation of TQM, the implementation status and resulting outcomes. According to analysts, the Deming Prize Committee allows applicants to identify their problems or needs and address those issues rather than specifying issues to be addressed. This enables applicants to develop and enhance their quality control methodologies.

Analysts define the Deming Prize as 'the last word in the world, on quality.' The popularity of the Deming Prize and the benefits reaped by the companies that won the Deming Prize attracted many companies to implement quality control measures, in order to win the prize. Though the Deming Prize was awarded to over 160 companies/company divisions/individuals since its inception, only four non-Japanese companies, Florida Power and Light Utility (1989), Philips Taiwan Division (1991), Credit Card Division and Power Systems Division of AT&T (1994) and SCL (1998), successfully met its quality parameters till the end of 1999.

SCL'S DEMING PRIZE JOURNEY

SCL had decided to apply for the Deming Prize in the early 1990s itself. This decision was the result of management's belief in the total quality control efforts that had started in 1979, after Venu Srinivasan (Srinivasan) became the CEO (1977). A SWOT analysis conducted by Srinivasan in 1997 revealed that though the company had a 90% share of the air-brake systems market in India, it was not competent enough to deliver world-class quality products. This analysis prompted the company to seek excellence through total quality control/management.

As a part of this initiative, SCL managers were introduced to the concept of Total Quality Control (TQC) and exposed to the quality control practices of world's leading companies. The managers were also trained in modern manufacturing techniques. By the mid-1980s, the TQC culture was well established at SCL. Famous Japanese quality control experts like Yoshio Kondo and Washio trained managers and employees

	extensively in TQC. The company also introduced the concept of quality circles[5][5]. To remain focused on quality control and to keep the employees interested in quality control practices, external targets such as winning national quality awards were set, following which the company won the Quality Circle Award of the Confederation of Indian Industry[6][6] (CII) in 1989 and the Quality Circle Federation of India awards successively for the next few years. According to analysts, TQC has to be translated into a culture in the organization, if the organization has to reap benefits. To make TQM a culture at SCL, Srinivasan threw a challenge to the employees – winning the Deming Prize. Suresh Lulla, CEO, Qimpro Consultants, "Such goals help inculcate a sense of pride and purposefulness in people." As a part of its strategy to win the Deming Prize, SCL appointed Yoshikazu Tsuda (Tsuda)[7][7] as its quality control consultant in the early 1990s. Under Tsuda's guidance, SCL integrated Deming's 10 parameters into four streams of its quality practices - policies, processes, products and people. The company's TQM model ensured Policy Deployment, Employee Involvement, Kaizen[8][8], Standardization and Training apart from promoting employer-employee relations. Under this model every employee of the company was a custodian of quality.[9][9] SCL began to prepare itself for the Deming Prize by formalizing a clear company-wide quality policy. The policy stated, "Sundaram Clayton will deliver a level of quality that totally meets customer expectations. This customer satisfaction will be obtained by supplying products of the right quality, at the right time, and at the right place. Total employee involvement and continuous improvement in every sphere of activity will be the twin supports on which Sundaram-Clayton quality will stand." This conformed to the guidelines of the Deming Prize that quality was everyone's job and was not just the management's responsibility. Srinivasan said, "Quality is a multi-faceted body. It has to encompass the entire organization." Thus the policy framework at SCL was extended to the entire organizational value-chain comprising product development, operations, marketing, finance and personnel. The policy framework		

clearly spelt out the objectives of employees at levels, from the CEO (for the next 5 years) to the machine operator (for the next 30 minutes).

SCL's quality initiatives began at the product design stage itself. In the late 1980s, the company switched to the product module system from process module system to ensure that quality standards and problem solving were more product-based rather than process-based. Following this, the company's product lines such as compressors, actuators and valves began to operate as separate modules. This meant that a team of workers was responsible for a complete product and not just a specific component or process. Product features were tailored accurately to meet customer needs. The company emphasized on factors such as reliability, serviceability and durability of products. It got the customers to participate in the design and test stages of the products.

The product development team of SCL comprised members from different functional areas such as engineering, production, marketing, purchase and R&D. The team collected information from customers regarding their requirements, product-related problems, suggestions etc. It then examined various factors such as the life-expectation of the product, target-cost, production volume, and growth and availability of in-house expertise to meet the requirements. Based on these, the team sanctioned a design and developed a prototype, which was tested rigorously before being finally approved for manufacture.

SCL used concurrent engineering technique,[10][10] which considerably reduced its cycle-time. Thus, while one part of the product-development team designed the product, the other worked on setting up the components base. This way, the suppliers were also ready by the time customer approved the design and a prototype was made. Thorough fault-analysis and validation checks decreased the product-design and development costs significantly. Focus on customer needs, development of prototypes and quality checks also reduced the need for product replacements or expensive servicing.

With the help of Deming's Plan-Do-Check-Act (PDCA) cycle,[11][11] SCL identified certain key issues three months before the beginning of a new financial year. These issues were chosen and communicated to all levels in the company. SCL used

	'Managing Points and Checking Points' as TQC tools to control the course of operations after the operations had been defined. (The concept of management points and checking points can be understood with the help of the following: The objective of the company president will be his managing point and when it flows to the manager immediately below him, it will become the manager's checking point. Similarly, marketing head's sales target will be his managing point and when this target flows down to the next level, it will be spilt into checking points, the segment sales and territory sales.) SCL plotted these managing and checking points on a chart and vertically connected those points. The chart formed the pictorial representation of an organization involved in pursuing its stated policy objectives for that specific year. It implemented a company-wide quality control program, to record the progress (and any deviation) and depict it in the form of charts. Repeated deviations from the stated objectives were immediately attended to and corrected. According to Deming, inducting people into the quality culture of the organization is as important as the actual implementation of TQM tools, techniques and systems. SCL offered periodical on-the-job and off-the-job training to its employees. Apart from training them in their functional areas, the company also trained employees on the utilization of various statistical tools related to quality control. It was reported that on an average every employee at SCL spent 45 hours per year on classroom training, which was very high compared to the industry average of 4 hours. Employees were also trained on various aspects such as housekeeping, 5 Ss – Seiri (clearing up), Seiton (organizing), Seiso (Cleaning), Seiketsu (Standardizing) and Shitsuke (Training). Training included training in TQC tools such as control charts, cause-and-effect diagram, check-sheet, the Pareto chart, scatter diagram, histograms and other graphs and charts, which helped operators identify, analyze and solve day-to-day problems on their own (Refer Exhibit III). SCL encouraged employees to think rather than merely accept orders. SCL emphasized on quality circles. It had 67 Quality Circles, which improved operations in the organization. On an average 250 suggestions ranging from simple tasks such as changing the place of a coolant pipe to complex tasks such as altering in the tooling design, were implemented. Each quality control circle had six members and operated on specific projects, made monthly presentations to the management and competed for a reward. The PDCA cycle was used here as well, i.e., in the		

identification of projects (Plan), collection of information (Do), analysis (Check) and implementation of the solutions (Act).

TQM encompassed all the processes in the organization. Data related to every process - production, quality variations, time-related issues, productivity, faults and breakdowns and wastage was collected and analyzed continuously to establish cause and effect relationships and hidden linkages between the processes. This data-dictated analysis (data based) also helped determine, in accurate terms, the extent of the problem and the impact of the solutions. To implement this, SCL used Statistical Quality Control (SQC) across all units and functions.

For problem solving and system failure analysis, SCL employed Kaizen and Taguchi[12][12] techniques. Every machine had a daily-work management system, following which the operator met the quality and hourly production targets. Any deviations from this daily schedule were analyzed and rectified immediately at the problem-stage itself. This considerably reduced future deviations as it enabled the operator to trace the problem to its root and eliminate it.

Each component of SCL's products, passed through various stages of turning, milling and drilling, which meant increased number of activities. This in turn resulted in an increased probability of deviations and extended time-cycles. To arrest this, SCL leased out turning, milling and drilling operations to its former employees, making them a part of its vendor-base. This shifted the costs of checking for deviations and rectifying them, to the vendors. SCL also used the two-bin Kanban system[13][13] to reduce the in-process inventory costs, under which every stage manufactures only that many number of units as required by the next stage of the manufacturing process.

By late 1997, SCL had succeeded in establishing quality as a culture in the organization. In February 1998, the company submitted its application to the Deming Prize Committee. After eight-month evaluation process, which started in February 1998 and ended in October 1998, SCL was awarded the Deming Prize for implementing CWQC. In the words of Sarita Nagpal, senior counselor (TQM) at the Confederation of Indian Industry (CII), "It will be a great milestone not just for

Sundaram-Clayton, but Indian industry as a whole. It's one of the highest honours a company can achieve."

AFTER WINNING THE PRIZE

The defect rate in the manufacturing process at SCL decreased substantially and customer returns came down as a result of these quality control initiatives. New-product development time was reduced from 24-to-30 months to12-to-14 months. The turnover per employee increased by an estimated 18% annually while the gross value addition by every employee increased by 12% per annum.

The quality practices in the company also reflected in its financial performance. Between 1992 and 1997, sales grew at an annual rate of 35% while its net profits grew at an annual rate of 83%. Even though sales declined by 25% in 1998 due to recession in the automobile industry, company sources and the analysts commented that the company's internal performance had improved consistently, which was substantiated by the increased revenues during 1998-2001.

SCL's quality initiatives motivated many Indian companies to adopt quality control practices. In 1998, CII and Maruti Udyog took the initiative to encourage total quality control awareness in Indian companies. As a part of this, they decided to sponsor a group of eight Maruti vendors for the Deming Prize. These companies included Sundaram Brake Linings Ltd., Brakes India Ltd., Lucas TVS Ltd., India Pistons Ltd., GKN Invel Transmissions Ltd., Sona Steering Systems Ltd., Jay Bharat Maruti Ltd., and India Safety Glass Ltd. All these companies were already practicing TQM. Tsuda was to train and guide these companies in CWQC.

In 2001, Sundaram Brake Linings Ltd. (SBL –TVS Group company) bagged the Deming Prize, becoming the first brake lining company in the world and the fifth non-Japanese company to win the award. Other companies in the group were also reportedly preparing hard to win the Deming Prize in future.

Analysts claimed that the achievement of the TVS Group companies was remarkable in the light of protests against liberalization on grounds that the domestic industry was being destroyed. SCL and SBL had proved that Indian companies were capable enough of surviving and flourishing even amidst stiff competition and increasing globalization.

These companies had also proved that companies failed to implement practices such as TQM only due a lack of consistency in persuasion of quality initiatives. K.K. Nohria, CEO, Crompton Greaves, said, "Companies which fail to sustain their quality commitment consistently tend to blame the concept. The truth is, quality is about continuously rejecting the status quo, which is a tough thing to implement, but can have phenomenal results in the long run." (Refer Exhibit IV for reasons why TQM fails).

Analysts opined that with the success of these companies in achieving the Deming Prize, many Indian companies would embark on the quality journey in the future and deliver world-class products and services.

EXHIBIT I

SCL – PROFIT & LOSS STATEMENTS

(in Rs million)

Period ended	03/98	03/99	03/00	03/01
No. of months	**10**	**12**	**12**	**12**
Gross Sales	1,300.0	1,600.0	2,318.3	2,406.1
Net sales	1,300.0	1,600.0	2,318.3	2,406.1
Other income	93.7	131.8	145.6	146.3
Total income	**1,393.7**	**1,731.8**	**2,463.9**	**2,552.4**
Raw materials	23.0	(13.8)	(30.9)	22.8
Stock adjustment (Inc)/ Dec	0.6	22.7	(14.9)	(9.2)
Purchase of finished goods	604.4	727.1	1,182.8	1,172.5
Cost of material	628.0	736.1	1,137.1	1,186.1
Employee cost	179.5	213.1	350.2	363.8
Power & fuel	42.0	54.9	80.3	92.4
Advertising/ promotion/ public	49.4	48.5	2.7	5.7
Freight & forwarding	31.6	31.3	46.5	49.2
Other expenses	292.4	379.5	457.8	506.3
Cost of sales	**1,222.9**	**1,463.4**	**2,074.5**	**2,203.4**
PBIDT	170.8	268.4	389.3	349.0
Interest & finance charges	3.5	-	6.0	15.3
PBDT	167.4	268.4	383.3	333.7
Depreciation	41.0	57.7	79.9	94.8
PBT	126.4	210.8	303.4	238.9
Provision for taxation	28.8	52.5	76.7	60.0
Extraordinary items/ Prior year adj.	-	28.8	0.1	-
Adjusted PAT	**97.6**	**187.0**	**226.8**	**178.9**
Dividend payout	41.7	63.2	73.7	62.7

Source: www.indiainfoline.com

EXHIBIT II

DR. DEMING'S MAXIMS

1. Global competition is a race with no end against the best global teams. We all must improve continually.
2. Each employee wants to work well and improve, provided four conditions are satisfied: proper preparation for the job, training on the job, tools and motivation

that include interpersonal relations. All four are the responsibility of the management.

3. About 85% of problems are due to poor management. Therefore, it is not fair to blame the workers for these problems. Supervisors must ask themselves whether all the four above conditions have been satisfied. If not, it is the responsibility of the management to fix it, before blaming the worker.
4. Good employees are the wealth of an organization. It pays to invest time and effort in them for the future.

Source: ISQ Journal, March 2002.

EXHIBIT III

VARIOUS TQC TOOLS

Control Chart: A control chart indicates the range of variability possible in a particular process. Using control chart helps identify special causes that hinder the normal flow of the process and cause abnormal variations in the process.

Check Sheet: Check sheets are used to present data effectively, in a graphical format. It is a sequential listing of functions or operations.

Pareto Chart: A Pareto chart used to determine the factors that have the greatest cumulative effect on the process and arrange such factors in their order of importance. This enables the user to focus on few important factors in the process.

Flow Chart: A flowchart is a pictorial depiction of a process. It presents a step-wise break up of the process, which allows the user to identify errors that may occur in the process.

Histogram: Histogram is a graphical representation of the data that shows the dispersion and central tendency of the information, which helps evaluate of data distribution at various levels.

Scatter Diagram: It is a graphical tool that tries to establish the inter-relation between variables i.e. the influence of one variable on the other. A typical scatter diagram displays points representing the observed value of one variable in relation to that of the other variable.

Cause and Effect Diagram (Fish Bone Diagram): It is used to connect multiple possible causes with a specific outcome i.e. given a specific outcome, the diagram is constructed to identify and organize various causes responsible for that outcome, thus establishing the causes for that particular effect.

Source: www.managementor.com

EXHIBIT IV

REASONS WHY TQM FAILS

Lack of Customer Awareness: Companies focus more on the processes, problems, error rectifications and standardization procedures, ignoring the customers. Here, quality becomes an internally defined goal, which has no relevance to the market place (customers).

No Relation To Strategy: Many companies join the quality drive as a me-too activity without establishing a clear goal in line with their business strategy and long term-goals.

Lack of Compatibility: Companies choose one of the TQM models available for their quality practices without considering its compatibility with the companies' culture, operations and requirements. They apply the model mechanically, which generates no effective outcome.

Lack of Communication: In many cases, the top management fails to communicate its goals and objectives to employees. It neglects its responsibility of creating TQM awareness in the employees and explaining their role in its implementation.

Lack of Integration: Companies lay emphasis on employee empowerment, without emphasizing the fact that all the employees are parts of a single system. This results in a scenario where each employee becomes an expert in his area of operation and fails to transfer his expertise to meet the upstream or downstream (levels of organization/operations) needs.

QUESTIONS FOR DISCUSSION: (Each Questions carry 7.5 marks each)

1. Critically discuss the initiatives taken by Srinivasan to improve the quality standards at SCL. How far, do you think, these initiatives contributed towards laying the foundation to win the Deming Prize?
2. What are the parameters prescribed for the Deming Prize? Discuss the steps taken by SCL to meet the parameters laid down by the Deming Prize Committee to ensure that the TQM exercise was successfully implemented at all levels of the company.
3. Critically evaluate the benefits SCL derived from the implementation of company wide TQM.
4. Discuss why TQM initiatives fail to give the expected benefits to the companies. If you were the CEO/Quality manager, what would you do to ensure a successful TQM initiative

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SECTION A
Write Short Notes

S. No.		CO	Marks
1	Quality assurance	CO1	**2**
2	Non-Conformity	CO1	**2**
3	ISO	CO1	**2**
4	OSHA	CO1	**2**
5	Juan quality trilogy	CO1	**2**
6	Defective products	CO1	**2**
7	Defect	CO1	**2**
8	Quality of Design	CO1	**2**
9	CONQUAS	CO1	**2**
10	IEC standards	CO1	**2**

SECTION B
Attempt All Questions (Discuss the following)

1	Work Productivity	CO2	**4**
2	Six Sigma	CO2	**4**
3	Pareto Diagram	CO3	**4**

4	ABC analysis	CO2	**4**
5	ISO Standards	CO2	**4**
	SECTION-C **Attempt All**		
1	How will you assess quality performance of a city w.r.t to Smart City Mission	CO4	10
2	Explain the features of Swach Bharat and role of alternative finance in it.	CO3	10
3	Analyze critically quality ISO process for any construction company.	CO3	10
	SECTION-D		
1	Patrick was the county administrator responsible for safety on public construction projects, and one of his tasks was to oversee a safety program for the new Great American Ballpark, which is the new baseball stadium for the Cincinnati Reds. He cannot stop thinking about two recently completed high-profile stadium projects that ended with very different results. Miller Park, in Milwaukee, opened a year late after a crane collapsed during the construction killing three workers. Paul Brown Stadium (new home of the Cincinnati Bengals) was constructed on-time (in approximately 2.5 years) with a safety record far above industry averages. The safety program at Paul Brown Stadium was developed jointly by the Cincinnati Office of the Occupational Safety and Health Administration (OSHA), the County of Hamilton, and the major contractors on the project, and included budget resources for training, drug testing, and on-site medical facilities among other things. With a sample size of two, Patrick was having a difficult time deciding if the safety initiative on the Paul Brown Stadium really made a difference or if one project had very good luck while the project at Miller Park simply had very bad luck. In addition to formulating an overall safety plan, the county's legal counsel, Frank Jones, was really encouraging Patrick to push all potential liability to the contractors. This would be very different than the way business was conducted on the Paul Brown Stadium. In the Paul Brown Stadium, the county established an Owner Controlled Insurance Program, in which the county purchased third-party liability insurance for project contractors to cover workers' compensation and general liability. Individual contractors purchased first-party insurance to cover only losses to equipment or property owned or being installed at the site. Due to the size of the Paul Brown stadium project, higher limits, broader coverage, and greater retentions were obtained at lower cost to the overall project than individual contractors could have received. Despite the cost savings, Frank's argument was that the construction industry is far too risky for this county to accept that kind of liability.	CO5	**30**

Based on the cost and safety data available from the two projects, Patrick needed to develop his recommendations for the safety program at the Great American Ballpark jobsite including his response to Frank's concerns.

Miller Park

On July 14, 1999, three iron-workers, in a suspended personnel platform monitoring the hoisting of a roof section, died after falling approximately 300 feet to the ground when their platform was struck by the collapsing heavy-lift crane. The crane known as "Big Blue" was lifting a section of the stadium roof weighing over 450 tons. Several environmental factors contributed to the accident including the wind and soft soil. The wind speeds that day were 20-21 mph with gusts to 26-27 mph, and the boom on the crane was rated to 20 mph. Also, the crane sank about a foot into the soil when it initially lifted the roof section earlier that morning.

Was the safety program at fault or did they just have bad luck?

Following the crane collapse, OSHA investigated the job site and issued citations to three firms: Mitsubishi Heavy Industries America, Inc. ($240,500), Lampson International Ltd. ($131,300), and Danny's Construction Company, Inc. ($168,000). The final penalties were reduced later in litigation and settlement. The specific violations cited are listed in Exhibit 1.

The OSHA Area Director for Milwaukee believed that compliance with OSHA requirements would likely have prevented this tragedy. The failure to take into account the wind was considered a significant factor. After the accident and investigation, several changes were implemented for the completion of the project:

- A new crane was installed with anemometers at the tip of the boom and computerized load monitoring
- Mats were installed to ensure safe foundations
- Anemometers were mounted on the crane boom tip and stadium roof for continuous recording
- Wind loads and specific site parameters were calculated for all lifts

Even if that fateful day was to be ignored, OSHA had previously responded to several incidents at the site including:

- An employee fell about 80 feet and survived by hitting an occupied scaffold. The employee that fell was back at work in a few weeks while the person on the scaffold was put on disability.
- A grinding wheel bounced off the surface being smoothed and hit the user in the leg. There was no major damage.
- A 25-ton roof section shifted in a sling and broke a man's leg.

- An explosion occurred while a heater was being lit which burned two employees.

And the day of the crane collapse, OSHA investigators were inspecting the site because of concerns about visible fall hazards.

The park opened for the 2001 baseball season - a year late because of the crane accident. Total construction time including repair time for the crane accident was 53 months.

Through December 2001, $413.9 million has been spent on park construction, which was 28.5% more than the $322 million first anticipated. This cost figure does not include the $100 million in repair costs covered by insurance for the crane accident or the potential costs of $99.25 million in civil and punitive damages a jury awarded to the beneficiaries of the three ironworkers who were killed (also covered by insurance). An appeals court decision later reduced this award to $27 million, but other appeals are expected that could raise this figure. (It is not expected that the figure could be lowered any more). The total costs will approach $1 billion when all the lawsuits are finished, and the interest on the bonds is included ($330.8 million).

Paul Brown Stadium

Paul Brown Stadium was considered a major success for a large construction project. The stadium was constructed for $453 million in approximately 2.5 years. The stadium opened for the fall football season, September 10, 2000.

By November 2000 with only minor finishing work remaining, the project had logged 3.35 million man-hours, with a job-lost time rate of 0.95 (national rate for construction industry: 4.0) and an OSHA recordable rate of 5.48 (national rate for construction industry: 10.4).[2] The project was completed with 92 OSHA recordable accidents, 16 involving lost time, no fatalities, and one fall injury. Actual losses due to accidents were only 42% of the original estimated losses, and the net program savings were estimated at $4.6 million through reduced workers' compensation and general liability costs due to the low injury and illness rate.

Safety efforts at the job site have been exceptional and this has been attributed to the jobsite's participation in the MASTER project. The Cincinnati Area Office of OSHA developed a voluntary cooperative partnership with the contractors and Hamilton County to enhance overall job safety at the Paul Brown Stadium. The partnership, known as Mobilized Alliance for Safety, Teamwork, Education and Results (MASTER) was designed to increase employee involvement, joint safety oversight by labor and management at job sites, teamwork between labor and management, and education of construction workers on construction sites. Details of the MASTER

project criteria are described in Exhibit 2. Some of the important program elements include training, on-site medical facilities, and drug testing.

Patrick was contemplating whether or not he believes the additional costs associated with the MASTER project were justifiable or if he could accomplish an acceptable level of safety with only some key initiatives. Also, he was preparing a list of additional information that might be necessary to make his decision.

Exhibit 1 - OSHA violations cited after crane collapse

- Failure to factor wind into the crane loading
- Lifting workers during high winds
- Three people in the personnel platform (exceeded the number required for the work being performed)
- Failure to follow the manufacturer's limitations on the crane
- Lifting loads in excess of the crane's rated capacity
- Not keeping workers clear of suspended loads
- Failure to properly calibrate the load indicator
- Improper ground loading conditions

Exhibit 2 - MASTER project

The goal of the MASTER project is self-compliance through the cooperative efforts of labor, management, and OSHA in the construction industry. According to the 1999 BLS, construction had a fatality rate of 14.0 per 100,000 employees compared with general industry's 3.6 per 100,000, and on average OSHA has traditionally devoted roughly 40-50% of its compliance resources to enforcement activities within the construction industry.

The MASTER project was developed in 1993 to not only address the hazards within the construction industry but also to promote and recognize those jobsites controlled by a contractor that had a demonstrated and effective safety and health program in place.

1. Contractor selection criteria are important for success and safety of a project. Elaborate. (12)
2. Do thorough accident investigations for the projects. (18)