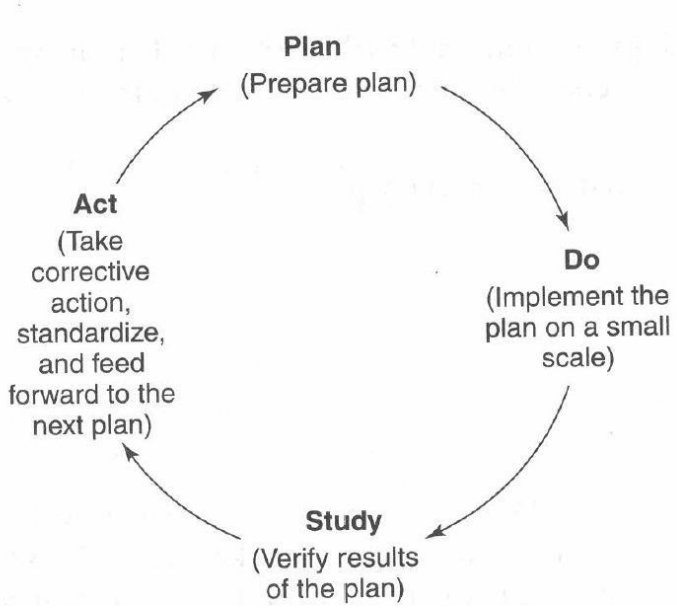
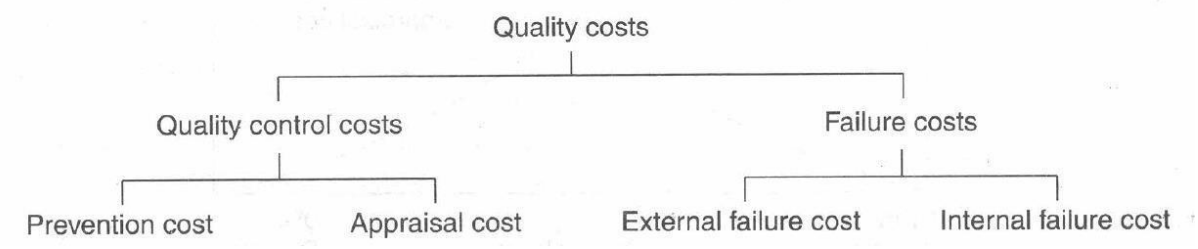
CMR INSTITUTE OF TECHNOLOGY							
Sub:	Construction Management & Entrepreneurship						
Date:	15.04.2019	Duration:	90 mins	Max Marks:	50	Sem:	VI

Question #		Question And Answer
1	(a)	**Explain the Safety procedures followed during using ladders and storing materials Being aware of the opportunities (06)** **Ladders** i. Ladders should be of good construction, sound material and adequate strength. No ladder with defective or missing sung or with any sung which depends for its support solely on nails, spikes etc. should be used. ii. Wooden ladders should not be painted, as paint covers up the defects. iii. Whenever platform is 1.5 m or more above the ground, ladder or stairway should be provided. Every ladder used for a vertical height of more than 9 meters should be provided with an intermediate landing. iv. The materials and tools should wherever practicable, be pulled up with a rope and should not be taken by ladders. v. A ladder should not be placed upon a box, barrel or other movable insecure object. The slipping of a ladder at either end should be carefully guarded against where the supporting surfaces are smooth and vibrating. **Materials** It is the basic principle that all buildings materials must be stored in such a manner as to prevent deterioration or intrusion of foreign matter and to ensure the preservation of their quality and fitness for use. Materials stored at site, depending upon the individual characteristics, should be protected from atmospheric effects due to rain, sun, wind or moisture to avoid deterioration. Sufficient precaution must be accorded against fire and other hazards to the materials like timber, coal, paint, petrol, explosives etc. Following are the safety measures to be adopted in stacking and storage of materials as per their characteristics. **a. CEMENT** Cement bags should be placed in stacks on raised platform, dry and impervious to water, with adequate waterproof covering and at least 30cm clearance from any wall. The stacks should not be more than 12 bags high. Where bulk handling of cement is undertaken, protective masks should be provided to the workmen. **b. LIME** Lime should be stored in a suitable shed to protect it from dampness. It should not be stacked against any wall. Storage of unslaked fat or semi hydraulic lime is not desirable as it deteriorates by absorption of moisture from atmosphere. **c. MASONARY UNITS** Bricks should be stacked at site on level ground in not more than 1.5 m in height. Bricks of different types and classification should be stacked separately. Similarly stone blocks and concrete blocks should be stored in stacks avoiding toppling of stacks as well as crushing of the lowest layer blocks. **d. AGGREGATE**

		Fine aggregates like sand, surkhi, cinder and coarse aggregate like stone chips, brick ballast should be stacked on a hard surface or platform in such a way to prevent the admixture of clay, dust, vegetable and other foreign matter. **e. TIMBER** Timber should be piled in stacks, above the ground level by at least 15 cm with an airspace of about 2.5 cm round scantlings. The width and height should not exceed 2 m and distance between adjacent stacks must be 20 cm atleast. The stacks must be protected from hot day wind or direct sun or rain. **f. STEEL** Steel reinforcement should be stored in a way to prevent distortion and corrosion. It is desirable to coat reinforcement with cement wash before stacking to prevent scaling and rusting. For moving heavy steel sections suitable handling equipment should be provided and workmen should never be allowed to lift with bare hands or carry them on shoulders. **g. DOOR, WINDOW FRAMES** Metal frames, aluminium frames, wooden frames and prefabricated frames of doors and windows should be stored in upright position adopting suitable measures against risk of subsidence of soil/support. h. **OTHER MATERIALS** Small articles like screws, blots, nuts, door and window fittings, w/s and sanitary fittings, electrical fittings should be kept in suitable and properly protected containers separately in store rooms. Fire extinguishers and fire buckets must be provided where fire hazards exist.
	(b)	**Write in detail about auditing (04)** A **quality audit** checklist is a **quality** record that tracks the questions and responses during a **quality audit**. The **quality audit** is a valuable tool for continuous improvement. **Audits** ensure your **quality assurance** system is sound. **Audits** are also necessary for ISO 9001 registration. A quality assurance audit is a documented, systematic process, performed in a planned manner by competent independent personnel with the objective of evaluating the application by an organization to the principles and requirements of defined quality regulations and customer expectations". 1) An audit is a "benchmarking process", i.e. an audit will give a status of the current performance of a process. This status can be measured against a published standard, or versus an approved operating procedure, versus a peer department, versus competitor companies, etc.. 2) An audit should be utilized as a method for driving improvement. The audit may identify shortcomings in process performance, may identify changing trends in performance, may identify deficiencies in staff knowledge or competence. Any such findings can then become the basis for improvement activities. 3) The quality audit should be a means of standardization. By implementing an audit program, equivalent standards of performance can be developed across different functions. The knowledge gained can be applied to ensure procedures are consistently utilized or equivalent competence requirements are set for staff. In the wider community, regulatory bodies for example use the quality assurance audit, to ensure quality standards are consistent across different product manufacturers. 4) The quality assurance audit is frequently applied back through the supply chain, where

		purchasing organizations utilize audits to force minimum quality standards on suppliers. Frequently a supplier cannot become "approved to supply" a product or service, without first having passed the audit and addressed any shortcomings in their quality management system. 5) Learning and Training. A key point to understand as part of the audit program, is the potential for learning and knowledge transfer during the audit process. Where the auditor has a good understanding of the product or process, he / she can use the audit as a form of training for the person being audited. By explaining the reasons for particular requirements, or test points, or record requirements, the person being audited can personally develop their process or product knowledge. 6) Regulatory and standard compliance. The audit will confirm the compliance status of a process or product versus applicable regulatory or standard requirements. The audit can expose any gaps against requirements, which can then be addressed.
2	(a)	**Describe Contractors All Risks Insurance (CAR) (06)** This insurance offers comprehensive and adequate protection against loss or damage in respect of the contract works, as well as third party claims in respect of property damage or bodily injury arising in connection with execution of civil engineering projects including temporary structures, and construction machinery. This insurance provides insurance on all risk *i.e.* on almost any sudden and unforeseen loss or damage occurring to the property insured. **This includes loss caused by:** i. Fire, lightning and explosion ii. Flood, rain, wind storm, snow avalanche iii. Earthquake, landslide, rockslide. iv. Theft, burglary v. Bad workmanship, lack of skill, negligence, human error. **This does not include loss caused by:** i. Loss or damage due to war or warlike operations, strike, riot. ii. Loss or damage due to willful negligence. iii. Loss or damage due to nuclear reaction, radiation or radioactive contamination. iv. Claims due to penalty losses. v. Loss due to replacement, repair or rectification of any deficiencies in the contract, works.

	(b)	**Draw and Explain PDCA/ PDSA Cycle. (04)** As the name suggests, PDSA cycle suggests preparation of a plan of things to be done as a first step, followed by its execution (doing whatever has been planned) as a second step. In the third step, results of the plan during execution are studied. Issues regarding the execution exactly as per plan and any variations are studied during this step. Finally, in the fourth step, the results are checked by actually identifying what went according to plan and what did not follow the plan. Using this insight, a revised and improved plan is worked out and the entire process is repeated.  **The PDSA/ PDCA Cycle**
3	(a)	**What are the various Cost of Quality? (10)** Construction projects are capital-intensive and cost of quality acquires a great significance. According to Juran, the cost of quality can be considered in terms of economics of the conformance quality. The quality cost breakdown shown in Figure 13.5 is based on the work of Feigenbaum (1983), who first described the concept in 1956. From Figure 13.5, it is clear that *Quality Costs = Quality Control Costs + Failure Costs* (13.1) Where, *Quality Control Costs = Prevention Costs + Appraisal* (13.2) And *Failure Costs = Internal Failure Costs + External Failure Costs* (13.3) The prevention costs used in the above equation refer to the cost of quality control activities undertaken before and during production. In other words, prevention cost is the cost of efforts undertaken to prevent failures. The appraisal cost is given by the costs incurred for quality control or quality assurance after production—for example, the costs of inspection, testing and examination to assess that the specified quality is being maintained.



Quality Cost Breakdown

The internal failure cost is the cost resulting from a product or a service failing to meet the quality requirements—for example, warranties and return, liability costs, product recall cost, and direct cost or allowances.

The external assurance costs include:

- Costs relating to the demonstration and proof/objective evidence to customers
- Cost of testing by recognized, independent testing bodies for quality assurance provisions, demonstration and assessments
- Cost of independent assessment/third-party agency performing a detailed and in-depth study of company's QA activities

The prevention and appraisal costs being optional, they have also been referred to as discretionary (Blank and Solarzano 1978) or controllable costs (Besterfield 1979). A failure refers to the non-achievement of requirements.

4 (a) **Explain the Importance of Safety in Construction and explain it by stating Safety through legislations (05)**

Safety in Construction is a prime requirement but it is often neglected on work site. The range of construction and building activities involving complex techniques have led to many new problems of safety measures at site, resulting in a better work environment, higher productivity and greater contentment among workers.

Safety through Legislation

A number of legislations like, The Factories Act, 1948; Indian Explosives Act 1984; Mines Act 1952, Indian Boilers Act 1923 ; Indian Electricity Act 1910 ; Petroleum Act 1934 govern the safety of personnel and equipments in the country. But as we all know that legislation alone cannot ensure safety in operations, unless effective approach to prevention of accidents and promotion of safety consciousness is achieved. This is possible by adopting proper control measures including safe design of machines and processes and use of protection devices and personal protective equipments and also effective safety procedures and practices as well as creation of self-regulating system on the shop-floor.

To assure safety to workers and elimination of damage to machinery and equipments. Indian Standards Institute has done commendable job. It lays down:

i. Safety precautions to be taken during working operations.
ii. Requirements for effective maintenance of tools and equipments.
iii. Guidance on safe welding and cutting, use of powered industrial trucks, belt conveyers and fire-fighting equipments.
iv. Standards and specifications of safe industrial operations and practices.
v. Safety requirements for personal protective equipments.
vi. Standards for fire safety in workshop and safety procedures to be followed in electrical work and use of electrical appliances in hazardous area and explosives atmosphere.

		vii. Specifications for protective clothing, safety helmets, face shields and safety equipment for eyes, ears, lungs, hands, feet and legs. These includes eye and ear protectors, gas masks, gloves, safety boots and shoes for mines etc.
	(b)	**Where and How do Moral Problems Arise in Engineering? (05)** An engineered product or project goes through various stage of conception, design, and manufacture, followed by testing, sales and service. Engineers carry out or supervise the appropriate activities at whatever stage of this process a convenient division of labour has assigned them. The nature of the activity or project will generally dictate whether the engineers involved are civil, electrical, mechanical, or chemical engineers, to name only a few of the major branches of engineering. Engineers from the different branches or engineering departments may be grouped together in teams, or they may be isolated from each other but with some form of liaison among them. The following four specific examples touch on a few of the areas covered by engineering ethics: 1. An inspector discovered faulty construction equipment and applied a violation tag, preventing its continued use. The inspector's supervisor, a construction manager, viewed the case as a minor infraction of safety regulations and ordered the tag removed so the project would not be delayed. The inspector objected and was threatened with disciplinary action. 2. An electric utility company applied for a permit to operate a nuclear power plant. The licensing agency was interested in knowing what emergency measures had been a established for human safety in case of reactor malfunction. The utility engineers described the alarm systems and arrangements with local hospitals for treatment. They did not emphasize that these measures applied to plant personnel only and that they had no plans for the surrounding population. "That is someone else's responsibility, but we don't know whose," they answered upon being questioned about this omission. 3. A chemical plant dumped wastes in a landfill. Hazardous substances found their way into the underground water table. The plant's engineers were aware of the situation but did not change the disposal method because their competitors did it the same cheap way, and no law explicitly forbade the practice. Plant supervisors told the engineers that it was the responsibility of the local government to identify any problems. 4. Electronics Company ABC geared up for production of its own version of a popular new item. The product was not yet ready for sale, but even so, pictures and impressive specifications appeared in advertisements. Prospective customers were led to believe that it was available off the shelf and were drawn away from competing lines.
5	(a)	**What are the Dimensions of Quality? (04)** i. Performance: It is the main operating characteristics of a product (E.g. Comfort in an automobile) ii. Features: Enhancement that is supplementing the product's basic function. (E.g. Remote control switch in a colour TV set). iii. Reliability: Probability that a product will fail within a given period of time. iv. Conformance: The extent to which the product's design & operating charges, satisfy the pre-determined standards. v. Durability: Measure of product's useful life vi. Serviceability: Time consumed in servicing, courtesy, competence & ease of repair or reconditioning of a product. vii. Aesthetics: Human response to a product (how it looks, feels, sounds, tastes or smells, i.e. appeals to senses). Perceived Quality: Impressions formed about the product's quality from tangible & intangible features of the product, brand image, good will & the reputation of the organization

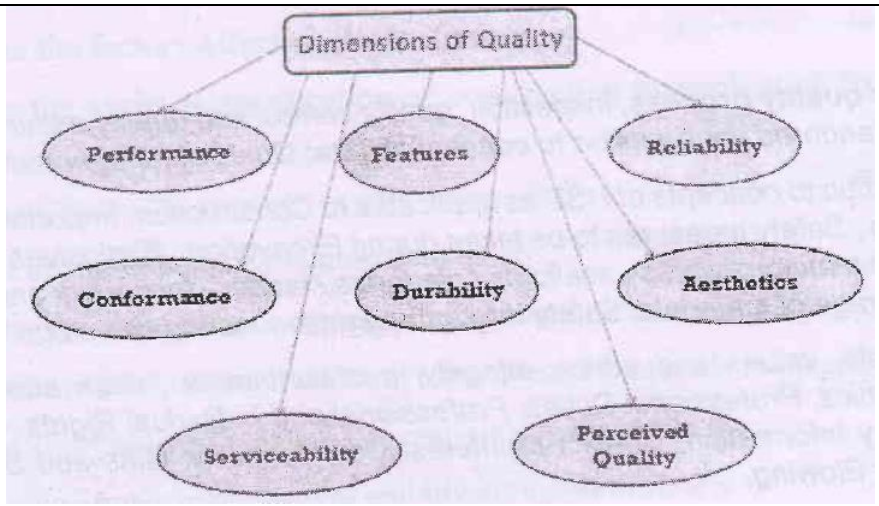


Figure: Dimensions of Quality

(b) **Describe in detail about the 7 quality management principles (06)**

6	(a)	**Explain the difference between Quality control and quality assurance (04)**

	Quality Assurance	Quality Control
Definition	QA is a set of activities for ensuring quality in the processes by which products are developed.	QC is a set of activities for ensuring quality in products. The activities focus on identifying defects in the actual products produced.
Focus on	QA aims to prevent defects with a focus on the process used to make the product. It is a proactive quality process.	QC aims to identify (and correct) defects in the finished product. Quality control, therefore, is a reactive process.
Goal	The goal of QA is to improve development and test processes so that defects do not arise when the product is being developed.	The goal of QC is to identify defects after a product is developed and before it's released.
How	Establish a good quality management system and the assessment of its adequacy. Periodic conformance audits of the operations of the system.	Finding & eliminating sources of quality problems through tools & equipment so that customer's requirements are continually met.
What	Prevention of quality problems through planned and systematic activities including documentation.	The activities or techniques used to achieve and maintain the product quality, process and service.
Responsibility	Everyone on the team involved in developing the product is responsible for quality assurance.	Quality control is usually the responsibility of a specific team that tests the product for defects.
Example	Verification is an example of QA	Validation/Software Testing is an example of QC
Statistical Techniques	Statistical Tools & Techniques can be applied in both QA & QC. When they are applied to processes (process inputs & operational parameters), they are called Statistical Process Control (SPC); & it becomes the part of QA.	When statistical tools & techniques are applied to finished products (process outputs), they are called as Statistical Quality Control (SQC) & comes under QC.
As a tool	QA is a managerial tool	QC is a corrective tool
Orientation	QA is process oriented	QC is product oriented

	(b)	**Describe in brief about Total Quality Management (06)** According to Oakland (1995), TQM is a way of planning, organizing and understanding each activity that depends on each individual at each level. Ideas of continuous learning allied to concepts such as empowerment and partnership, which are facets of TQM, also imply that a change in behaviour and culture is required if construction firms are to become learning organizations. This is a complete management philosophy that permeates every aspect of a company and places quality as a strategic issue. Total quality management is accomplished through an integrated effort among all levels in a company to increase customer satisfaction by continuously improving current performance. TQM is a management-led approach applicable in all the operations of a company and the responsibility of ensuring quality is collective. The philosophy of TQM is one of prevention rather than defect detection. According to Pheng and Teo (2004), TQM is a way of thinking about goals, organizations, processes and people to ensure that the right things are done right the first time. It is an approach to improving the competitiveness and effectiveness, and flexibility of the whole organization. The Essential Elements of TQM are: Management commitment and leadership i. Training ii. Teamwork iii. Statistical Methods iv. Cost of Quality v. Supplier Involvement It is believed that adoption of TQM by construction companies will result in higher customer satisfaction, better quality products and higher market share. However, adoption of TQM requires a complete turnaround in the corporate culture and management approach, as compared to the traditional way of top management giving orders and employees merely obeying those. Construction, being different from manufacturing and other industries, has many unique problems that cause hindrances in adoption of TQM. Some of the major problems identified are: 1. Lack of teamwork 2. Poor communication 3. Inadequate planning and scheduling 1. No team-building exercises at the inception of projects 2. Lack of understanding of team members' expectations Little or no team-oriented planning and scheduling

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