

Exercise

1. Explain in brief the Ten Commandments created by the computer Ethics Institute.
2. How is social engineering attack used to trick users ?
3. Explain the term "Targeted Attacks". How is it used as a search engine to harm the social and business circles ?
4. Explain in brief the misuse of online games by the scammers with examples.
5. Describe in brief the most common online scams being used for framed and embezzlement of money.
6. Explain the various methods used by scammers to steal data from individuals and organizations.

CHAPTER

4

Engineer as a Role Model

4.1 INDUSTRIAL PRODUCTION

For boosting industrial production we have to exploit and make a maximum utilization of our production capacity by proper and efficient use of our resources related to man, machine and material. It also depends on other indirect supports i.e., quantity, quality and efficiency of manufacturing apart from capacity utilization, choice of product, available energy, process of manufacturing technique and raw material used. Utilization of capacity is a measure of performance indicators of an industry. Every industry is endlessly in a course of self-appraisal for measuring its own current performance vis-a-vis its various targets, past achievements and operative capacity. The main aim of any industry is to produce an item (or service) to sell at a profit. However, a well organised business will wish to make this profit making an ongoing process. Whilst a one-off sale will usually return a short-term profit, continuous and sustained income from profits is much more desirable.

In order to continue in business, any industry or company needs to make a continuous profit. This profit provides income that enables growth and development within the industry. It may be used to keep shareholders happy by paying them a dividend. It may be used to repair machinery, buy new equipment or to maintain current stock, or it may be directed to the owner's pay packet.

It is important to return a profit and in order to return a profit ; an industry needs to become efficient in whatever process it does. In becoming efficient, it will also produce more goods, which can be sold for a profit. This profit can then be re-invested in the company to help it become more efficient, and so on.

A century ago, industrial manufacturing was dominated by large-scale, energy-hungry processes such as smelting ores and machining metals. Today, the industrial landscape features an array of novel techniques operating on much smaller scales, making computer

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chips, carbon nano-fibers and other sophisticated products. Traditional processes included melting and casting metal, grinding and machining, and injection moulding of plastics, along with more recent innovations such as the use of lasers and water jets to shape materials. Rounding out the list of techniques were the wide range of processes used in the microelectronics sector, such as chemical vapour deposition and sputtering, as well as carbon Nano-fibre production. The evolution towards more technologically advanced manufacturing has happened at the cost of a sharp decrease in efficiency. The most hi-tech processes can take as much as a million times more energy and materials to make a given quantity of finished product than traditional industrial methods i.e., a trend that may hinder efforts to build a more energy-conscious industrial economy using cutting-edge materials and technology.

4.1.1 Production

Production is inevitably linked to efficiency. The more efficient an industry is, the more it can produce. Then it can make a large profit that reflects the company's efficiency. This increased production and profit can lead the company or industry in re-investing into its own operations in buying more equipment and/or to modernise the current equipment. It will need to do this in order to maintain its competitiveness against other similar companies. If too much of the profit is taken away from the business, then the efficiency of that company is in decline, as measured against other similar companies.

4.1.2 Efficiency

Efficiency is dependent upon the company's resources and its ability to manage these in respect to such areas e.g., its location (or address), access to surrounding industrial or technological facilities, the capabilities of the resources, technology and equipment on site skilled and semiskilled workers' expertise, management expertise, access to finance/ loans/capital, access to modern assembly techniques and similar technologies access to labour saving devices and a flexible and willing workforce. The following strategies are just a few examples of current industry management solutions resolve to efficiency problems.

- (i) Mass production (ii) Robotics
- (iii) Power tools, e.g., electric, battery, pneumatic (air powered), hydraulic
- (iv) Conveyor belts (v) Standardisation
- (vi) Lean production (vii) Outsourcing
- (viii) Computer-assisted equipment, e.g., computer-aided design (CAD), computer-aided manufacturing (CAM)
- (ix) Quality control and "quality circles"
- (x) Multiskilling
- (xi) Specialisation
- (xii) Electronic ordering and fund transfers
- (xiii) Invoiceless purchasing.

4.1.3 Quality Control

Quality control is a process that evaluates output relative to a standard and takes corrective action when output doesn't meet these predetermined standards. Therefore, products, designed and manufactured, are produced to meet and exceed the needs of customers. The purpose of quality control is to make sure that certain processes are performing up to a company's set standards. The statistical process control tries to correct the output standards to make sure they are up to specifications. Inspections can be considered an appraisal technique that compares goods or services to a standard. Inspection should not be eliminated because it is a vital aspect of quality control and service operations. Inspection and only allocate inspection at points that maximize effectiveness. Some of these points include :

- ❖ Raw materials and Purchased Parts
- ❖ Finished Products
- ❖ Prior to Large Investments
- ❖ Prior to Irreversible Changes
- ❖ Before a Covering Process

4.1.4 Quantity

For efficient mass production, automation is used in different processes of manufacturing such as machining and welding. Automated manufacturing refers to the application of automation to produce goods in a factory. The main advantages of automated manufacturing for the manufacturing process are realized with effective implementation of automation and include: higher consistency and quality, reduction of lead times, simplification of production, reduced handling, improved work flow and improved worker morale. Robotics is the application of mechatronics and automation to create robots, which is also often used in manufacturing to perform tasks that are dangerous, unpleasant, or repetitive. These robots may be of any shape and size, but all are pre-programmed and interact physically with the work. To create a robot, an engineer typically employs kinematics (to determine the robot's range of motion) and mechanics (to determine the stresses within the robot). Robots are used extensively in manufacturing engineering. Robots allow businesses to save money on labour, perform tasks that are either too dangerous or too precise for humans to perform economically, and to ensure better quality. Many companies employ assembly lines of robots, and some factories are so robotized that they can run by themselves. Outside the factory, robots have been employed in bomb disposal, space exploration, and many other fields.

4.1.5 Power/Energy Costs

Any manufacturing process uses power/ energy to transform raw materials into a desired product. But some fraction of the raw materials will generally go waste, and energy is not always used as efficiently as it might be. To better understand these losses, technocrats have developed a framework based on the laws of thermodynamics, that keeps track of both the energetic, as well as the physical or chemical transformations of materials, as they pass through the steps of an industrial process. With the exception of the methods that involved melting metal, the overall power requirements for each process were surprisingly similar, ranging from about 5 to 50 kilowatts of electricity. On the other hand, the amounts of material processed varied enormously, ranging from hundreds of kilograms per hour or more for the older processes to just a few milligrams per hour for two of the most novel techniques. A striking trend emerged: as processes become more technologically sophisticated, they tend to manipulate smaller and smaller quantities of material at slower rates, but since power consumption per process has stayed about the same, the amount of energy needed to generate a given quantity of finished product has been growing fast. An inefficient process operating on a tiny amount of material may not be very important when set against the entirety of industrial energy use. The world now produces more than 20,000 tons of electronics-grade silicon per year, consuming about 50 billion kilowatt hours of electricity in the process. Production of carbon fibres, which are often proposed for large scale applications, is in the same category in terms of energy used per kilogram of product.

Modern industrial techniques often require elaborate materials and procedures with exact energetic and material costs but don't get directly incorporated into the product. For example, highly reactive gases may be used to clean production equipment for silicon chips in preparation for other steps, and those gases may have to be chemically treated after use for safety or pollution-control reasons. These ancillary but essential elements of a hi-tech manufacturing process can reduce enormously its "degree of perfection" i.e., the ratio of the thermodynamic value of the product to the thermodynamic value of everything that was needed to make it. The more ideal a process, the closer that ratio will be to 1:1. In reality, processes can vary significantly in their degree of perfection. For example, it was calculated that an electric furnace that melts scrap and other iron to produce a refined metal output can have a degree of perfection of 0.79. By contrast, a chemical vapour deposition method used by the semiconductor industry to produce thin layers of silicon dioxide can have a degree of perfection of not quite four millionths. In designing processes that turn expensive materials into small quantities of hi-tech products, manufacturers have focused their attention on a variety of issues such as size and quality, but haven't had strong incentives to reduce energy consumption. Manufacturers of solar panels, for example, are well aware of the energy-intensive nature of the processes they use, and figure it into estimates of the pay-back time in energy as well as money of the devices they make. To be truly green, in other words, a solar panel must deliver substantially more energy over its lifetime than was consumed in creating it. That kind of thinking hasn't yet taken hold in other areas, such as Nano-materials, where the energy costs of manufacturing are not widely known. As more applications of such materials gain attention, especially in the context of "green" technology, there will have to be a serious conversation about dealing with energy costs.

4.1.6 Capacity Utilization

Manufacturing capacity utilization is such a key indicator of manufacturing efficiency and economic performance which explains changes in investment, inflation, long-run growth etc. It may be noted that even the analysis of total factor productivity would be more meaningful if adjustment is made for fluctuations in capacity utilization.

The overriding importance of capacity utilization in the overall resource-use and efficiency of the economy shows the existence of excess capacity in the industrial sector in India because most of the industries are demand-constrained. The definition of installed capacity differs from firm to firm. There is no uniform way to define it and it is not clear how firms respond to the question of their capacity. Many of the firms report capacity based on a single shift operation, which is not the case in practice. This creates ambiguity in explaining the results also. Shortage of raw materials and foreign exchange, labour unrests etc. has been identified to be the such underutilization. Industrial products are classified into five groups of industries namely-metal products, machinery other than electrical, electrical machinery and appliances, transport equipments, chemicals and chemical products, paper products and consumer goods.

Products with more than 60 percent unutilized capacity consist of chemical, fertilizer's, drugs, steel, rubber, steel forgings and nonferrous alloys etc. Shortage of raw materials, shrinkage of demand and labour problem followed by shortage of power might be the possible reasons for underutilization of capacity.

The supply factors that affect capacity utilization include availability of raw materials and inputs, infrastructural bottlenecks such as power shortage and transport bottlenecks etc. The demand factors include changes in domestic and foreign demand caused by changes in tastes or by general macro-economic situations. Industry groups like diesel engines, railway wagons and vanaspati etc. which operate with more than excess capacity face mainly demand constraints. Agricultural tractors and cotton cloth (mills) with excess capacity of more than 25 percent face mainly supply constraints. Capacity utilization has improved after the path breaking economic reforms got under way in 1991. While there does not exist a unique relationship between the prevalent policy regime and industrial performance, optimal combination of policies capable of correcting some of the structural imbalances can create a favourable environment for better industrial performance. Low capacity utilization of the state owned Indian airlines and Air India has deteriorated on account of fuel prices, excess staff, serving uneconomic routes and increasing expenses on insurance. Low capacity utilization has rarely been cited as one of the main reasons for their poor financial performances.

Other major issues which play the significant role are demand and supply factors affecting the level of capacity utilization. The impact of economic reforms per se is not significant, the policy changes may influence supply and demand side factors determining the level of industrial capacity utilization. Capacity utilization is positively related to size of the firm, market share and market concentration. Import liberalization has an adverse effect on capacity utilization in the industries.

"It has been found that capacity utilization in India as a measure of performance of industrial sector has received very little attention."



SUMMARY

- The main aim of any industry is to produce an item (or service) to sell at a profit. However, a well organised business will wish to make this profit making an on-going process. Whilst a one-off sale will usually return a short-term profit whereas, continuous and sustained income from profits is much more desirable. For boosting industrial production we have to exploit and make a maximum utilization of our production capacity by proper and efficient use of our resources related to man, machine, material and other indirect supports. In the earlier times industrial manufacturing was dominated by large-scale, energy-hungry whereas, today, the industrial landscape features an array of novel techniques operating on much smaller scales, making computer chips, carbon nano-fibers and other sophisticated products. The more efficient an industry is, the more it can produce to make a large profit. This increased production and profit can lead the company or industry in re-investing, to maintain its competitiveness against other similar companies. Efficiency of industry is dependent upon the company's resources and its ability to manage these in respect to such areas e.g., its location, industrial facilities, workers' expertise and access to finance. Quality control and quantity produced are very important factors for survival of any industry. Any manufacturing process uses power/energy to transform raw materials into a desired product. In modern industrial techniques a striking trend has emerged as processes become more technologically sophisticated, the amount of energy needed to generate a given quantity of finished product has been growing fast. Importance of capacity utilization in the overall resource-use and efficiency of the economy shows the existence of excess capacity in the industrial sector in India because most of the industries are demand-constrained.

Short Question Answers**1. Define the term "Industrial Productions".**

Ans. Industrial production is maximum profitable utilization of our production capacity by proper and efficient use of our resources related to man, machine and material with the help of other indirect supports i.e., quantity, quality and efficiency of manufacturing apart from capacity utilization, choice of product, available energy, process of manufacturing, technique and raw material used.

2. How is production linked to efficiency ?

Ans. Production is inevitably linked to efficiency. The more efficient an industry is, the more it can produce. Then it can make a large profit that reflects the company's efficiency.

3. How profit earned is important to continue in business ?

Ans. The increased production and profit can lead the company or industry in re-investing into its own operations in buying more equipment and/or to modernise the current

equipment. It will need to do this in order to maintain its competitiveness against other similar companies. If too much of the profit is taken away from the business, then the efficiency of that company is in decline, as measured against other similar companies.

4. Why and how the quality control and quantity produced are related to each other to become important for the survival of industry ?

Ans. Quality control is a process that evaluates output relative to a standard and takes corrective action when output doesn't meet these predetermined standards. Higher the quantity of production, higher will be the profit. For efficient mass production, automation is used in different processes of manufacturing. The main advantages of automated manufacturing advantages include higher consistency of quality production with greater profits.

5. Explain the importance of power/energy cost in manufacturing.

Ans. Any manufacturing process uses power/energy to transform raw materials into a desired product. In modern industrial techniques a striking trend has emerged: as processes become more technologically sophisticated, the amount of energy needed to generate a given quantity of finished product has been growing fast, hence also the electricity bills.

6. How is capacity utilization important in manufacturing ? Compare the effects of under utilisation of capacity and excess manufacturing capacity.

Ans. Major issues which play the significant role are demand and supply factors affecting the level of capacity utilization. Manufacturing capacity utilization is such a key indicator of manufacturing efficiency and economic performance which explains changes in investment, inflation, long-run growth etc. The overriding importance of capacity utilization in the overall resource-use and efficiency of the economy shows the existence of excess capacity in the industrial sector in India because most of the industries are demand-constrained. Capacity utilization is positively related to size of the firm, market share and market concentration. Import liberalization has an adverse effect on capacity utilization in the industries.

Exercise

- How is efficiency linked to higher production ?
- Compare the present industrial manufacturing processes with that of the past.
- Explain the factors responsible for higher efficiency in the industry.
- Why is quality control important and related to production for survival of business ?
- How does automation and robotics help enhancement in quantity of production, explain ?
- What do you mean by utilisation of capacity in industrial production ?



4.2 TEAM WORK SPIRIT

It has been recognised as a link between the staff as a group which works closely together at a happy productive workplace. Extra-curricular activities which take place outside the office are usually a mix of work-oriented social activities used as team building events. Their purpose is to simultaneously break down barriers between individuals and departments and foster a close understanding among employees. Team working events and policies need careful planning for keeping a balance between goals and responsibilities of each employee. A best team award can also be established to motivate the employees. The ethos of teamwork extends to treat every employee the same way, whether on contract or permanent basis. The teamwork between permanent and contract staff has to be so seamless that any business partner remains unaware that who is contract staff and who is permanent one. Team working does not arise spontaneously among staff. It requires an investment of time, attention and budget to create, maintain, harvest and monitor.

Communication between different departments requires being encouraged through formal and informal measures so that all senior managers and their juniors sit in a common area, rather than in their own teams. Everybody should have an understanding of his/her mutual roles and responsibilities with set objectives to identify the different roles needed to achieve their goals in different ways, i.e., by delivering, managing and supporting each other. A culture of team working reduces excessive competitiveness between staff in the same department, which can otherwise harm overall productivity.

Although emphasis on teamwork brings a host of benefits i.e., from helping each other to bonding colleagues to work collaboratively, yet it is important that it should not become an excuse for staff to shirk from their individual obligations and targets. It is important to note that the individuals retain clear ownership of their objectives and the business benefits they are responsible for delivering. The employees are to be encouraged to work outside their usual role, as and when necessary to help colleagues. Team working can help knowledge transfer between staff. Everybody as a team has to be flexible to support each other according to the requirement of situation. Although they may have their own jobs, yet sometimes it is a question of 'whosoever is there'. The teamwork ethos is also boosted by the challenging nature of the job at work because the increasing complexity of work and speed of change means that there is no place for the classic stereotype of working. Everyone in the team has to communicate and be a proactive part of it. Teamwork is not an end in itself, and is justified only when it contributes to overall, long-term productivity.

Teamwork needs to be nurtured by the organisation because, however many mechanisms you may have in place to create and support teamwork, you can still be taken by surprise on various occasions i.e., unanticipated issues crop up, or someone doesn't know something you thought he/she did. All the teams don't work well together therefore managers must ensure that the right mix of personalities is engaged, otherwise friction can develop in the team, which can be destructive.

Teamwork has also to adapt to changing business circumstances. Within various departments team members should sit down and run through key business projects together,

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and set up all projects on corporate portal so that everyone in the team on the different business projects can see the status of individual projects. This step will aid mutual communication and understanding on projects.

SUMMARY

- ◆ Team work spirit has been recognised as a link between the staff as a group which works closely together at a happy productive workplace. Communication between different departments requires being encouraged through formal and informal measures so that all senior managers and their juniors sit in a common area, rather than in their own teams. The employees are to be encouraged to work outside their usual role, as and when necessary to help colleagues. Team working can help knowledge transfer between staff. Everyone in the team has to communicate and be a proactive part of it. Teamwork is not an end in itself, and is justified only when it contributes to overall, long-term productivity. All the teams don't work well together therefore managers must ensure that the right mix of personalities is engaged.

Short Question Answers

1. What do you understand by the term "Team Work spirit", explain ?

Ans. It has been recognised as a link between the staff as a group which works closely together at a happy productive workplace. Extra-curricular activities which take place outside the office are usually a mix of work-oriented social activities used as team building events. Their purpose is to simultaneously break down barriers between individuals and departments and foster a close understanding among employees.

2. How is communication important for team work ?

Ans. Communication between different departments requires being encouraged through formal and informal measures so that all senior managers and their juniors sit in a common area, rather than in their own teams. Everybody should have an understanding of his/her mutual roles and responsibilities with set objectives to identify the different roles needed to achieve their goals in different ways.

3. How does the term "Whosoever is there" boost team work ethos ?

Ans. Everybody as a team has to be flexible to support each other according to the requirement of situation. The teamwork ethos is also boosted by the challenging nature of the job at work because the increasing complexity of work and speed of change means that there is no place for the classic stereotype of working. Everyone in the team has to communicate and be a proactive part of it. Although they may have their own jobs, yet sometimes it is a question of 'whosoever is there'.

Exercise

1. What is the importance of colleguehip in team work ?
2. Why is it important to have a right mix of personalities in team work ?
3. How does team work handle changing business circumstances ?



4.3 WORK CULTURE

Work Culture in any organisation includes the organisation's vision, values, norms, systems, symbols, language, assumptions, beliefs and habits. Work culture is a set of shared assumptions that guides what happens in organisations by defining appropriate behaviour for various situations. It is also the pattern of such collective behaviours and assumptions that are taught to new organisational members as a way of perceiving and, even, thinking and feeling. Thus, organisational culture at the work place affects the way people and groups interact with each other, with clients, and with stakeholders. In addition, organisational culture may affect how much employees identify with an organisation and are satisfied with their job.

A strong culture is said to exist in an organisation where staff responds to stimulus because of their alignment to organisational values. In such environments, strong cultures help firms operate like well-oiled machines, engaging in outstanding execution with only minor adjustments to existing procedures as needed. Conversely, where there is weak culture there is little alignment with organisational values, and control must be exercised through extensive procedures and bureaucracy.

Research shows that organisations that foster strong cultures have clear values that give employees a reason to embrace that culture. A "strong" culture may be especially beneficial to firms operating in the service sector, since members of these organisations are responsible for delivering the service. Research indicates that organisations may derive the following benefits from developing strong and productive work cultures :

- (i) Better aligning the company towards achieving its vision, mission, and goals.
- (ii) High employee motivation and loyalty.
- (iii) Increased team cohesiveness among the company's various departments and divisions.
- (iv) Promotion consistency and encouraging coordination and control within the company.
- (v) Shaping employee behaviour at work, enabling the organisation to be more efficient.
- (vi) High job satisfaction to employees.

Where work culture is strong, people do work because they believe it is the right thing to do, and there is a risk of another phenomenon called group think, wherein the members' strivings for unanimity override their motivation to realistically appraise alternatives of action. This is a state in which even if they have different ideas, do not challenge organisational thinking, and therefore there is a reduced capacity for innovative thoughts. This could occur, for example, where there is heavy reliance on a central charismatic figure in the organisation, or where a friendly climate is at the base of their identity (avoidance of conflict). Members that are defiant are often seen as a negative influence by the rest of the group because they bring conflict.

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In order to increase productivity, growth, efficiency and reduce counter productive behaviour, organisations should strive for what is considered a "healthy" organisational culture. A variety of characteristics given below describe a healthy work culture, which include ;

- (i) Acceptance and appreciation for diversity.
- (ii) Regard for and fair treatment of each employee as well as respect for each employee's contribution to the company.
- (iii) Employee's pride and enthusiasm for the organization to derive a job satisfaction.
- (iv) Equal opportunity for each employee to realize his/ her full potential within the company.
- (v) Strong communication with all employees regarding policies and company issues.
- (vi) Strong company leaders/managers with a strong sense of direction and purpose.
- (vii) Ability to compete in industry innovation and customer service, as well as price.
- (viii) Higher than average total turnover (perpetuated by a healthy work culture).
- (ix) Investment in learning, training, and employee knowledge.

Performance oriented work culture have been shown to possess statistically better financial growth. Such cultures possess high employee involvement, strong internal communications and an acceptance and encouragement of a healthy level of risk-taking in order to achieve innovation. Additionally, organisational work cultures that explicitly emphasize factors related to the demands placed on them by industry technology and growth will be better performers in their industries.

4.3.1 Types of Organisational Work Culture

Before we get into the specific details of the different types of cultures, there are two overarching models that companies will fall into i.e., strong culture and weak culture. In a strong culture, employees have a sense of empowerment and understanding of the company goals, regulations and philosophy. This kind of culture allows employees to be driven and feel respected which benefits the overall health of a company. In a weak organisational culture, employees are lost, unmotivated and operate under a regime of fear. Fear may motivate individuals but not for long and for all of the wrong reasons. Employees should never feel that they will be wrongly reprimanded for making mistake or for needing a little extra guidance. If you have trouble disciplining your employees, don't get crazy on them for minor oversights. Let's explore some organisational work cultures below :

(i) **Academic Culture.** Academic culture depends on employees who are highly skilled, studious and welcome further training and advancement. This type of work place environment thrives on account of intense training for employees being brought on board and ongoing training for the employees already there. Organisations that choose to follow this culture are very particular about who they hire, their existing skill sets and their willingness to learn and grow. Although this format of management keeps turn-over rates low, yet the

employees are eager to do their job to the best of their ability. Many hospitals, universities and other educational institutions rely on academic culture to stay up to date on the newest information and technology.

(ii) **Normative Culture.** At corporate workplace, normative culture is very dry, following strict regulations and guidelines that uphold the policies of the organisation. Employees rarely deviate from their specific job role, break rules or do anything other than what is asked of them. These types of organisations run a tight ship and are not suited for every type of employee.

(iii) **Pragmatic Culture.** You know the saying "*the customer is always right*". Well, that is the first and only rule of a pragmatic culture workplace. The customer or client comes before anything or anyone else. Because every customer is different, these types of work places are very opposite of the normative culture environment as employees don't adhere to strict rules. Whatever the customer wants, the customer gets (within reason, of course).

(iv) **Club Culture (i.e., Nothing but the best).** This type of culture requires employees to be very skilled and competent in their niche of work. Educational qualifications, prior work experience and even personal interests are taken into consideration before an employee is hired. Club culture can be seen in organisations like the RAW, commercial pilots and specially branches of the military. The hiring process can be pretty intense for these work environments, requiring multiple interviews, a stellar resume (and references to back it up), background checks and so on. The upside of being a part of a club culture is that only your hard work will pay off. These types of employers often reward hard work with promotions but with that are frequent appraisals of your work and role within the company.

(v) **Sports Team Culture.** This could be the best type of organisational culture from an employee's stand point. Remember how pragmatic culture focuses on the customers? Well, sports team environments say it's all about the employees. As long as the workers are happy, comfortable and feel respected, the work will get done and the employees will want to stick with the company for the long haul. TCS is a good example of a sports team culture, the employees get to pretty much to do what they want, soup up their offices with whatever makes them feel creative. Company outings are a regular thing, social events within the office and incentives are a big component of this type of culture.

(vi) **Fortress Culture.** Contrary to sports team culture, fortress culture could be the worst for employees. This type of environment is all about the numbers. If the organisation is doing well as a result of the employee's productivity then the employees continue to have a job. If the organisation begins to see a downfall in success then the individuals who aren't pulling well are terminated. This type of work culture promotes wastage of the time and money invested in training these employees. With such a high termination rate these companies have to hire a new set of people and are forced to train them and later on to find that few of them cannot stay up to the required speed.

(vii) **Expectations Culture.** This culture is basically another way of saying micro-management. Employees are monitored at every step of the way and when something does not meet the standards or expectations of the company the employee is given guidance and

monitored further. It can be a tough (may also be called tough guy culture) environment for some to work in, especially if you are independent and have a creative mind. These types of companies just want to ensure consistency and commitment to their customers and they need employees who can be shaped to do just that. Performance evaluation comments can be tricky, try not to intimidate your employees, instead find tactful ways to say what you need to say.

(viii) **Process Culture.** This type of work culture provides a set of regulations and procedures that the employees follow. It's different than the normative culture as the regulations are not a bullet-pointed list of do's and don'ts. Employees know what they are getting into when they sign-up and are often self-starters. These employees are not micro-managed and they rarely are given performance reviews. If they are given reviews it's annually and it's to assess their work on a large scale, their aspirations within the company and potentially a discussion about salary. More often than not, government offices run and operate under the process culture.

(ix) **Bet Culture.** This culture is for the patient risk-takers. Organisations that follow this culture are known to literally bet the success or failure of their company on a single decision, of which the outcome is completely unknown. It can be a wild ride working for this type of company as you don't know what is going to happen each day. The consequences of the decisions made by the individuals working in the bet culture can be so dire that the company may go in heavy losses and contrarily, they can be so excellent that the company thrives more than ever before.

"There are many different types of cultures that develop within a company. Some companies practice with more than one of these and some are strictly one of the above. Overall, routing your employees on while ensuring the customers are happy is the best balanced culture. Try talking to your employees about what they like and dislike about the work place and you can begin understanding what changes need to be made for the health of your organization."

4.3.2 Rules for Creating the Right Conditions for a Good Organisational Work Culture

(i) **Hire the Right People.** Hire for passion and commitment first, experience second, and credentials third. There is no shortage of impressive CVs out there, but you should try to find people who are interested in the same things you are. You should get a sense of what the potential employee believes by asking the right key questions e.g., what do you love about your chosen career? What inspires you? What courses in school did you read?

(ii) **Communicate.** Once you have the right people, you need to sit down regularly with them and discuss what is going well and what isn't. It's critical to take note of your victories, but it's just as important to analyze your losses. A fertile culture is one that recognizes when things don't work and adjust to rectify the problem. Employees need to feel safe and trusted, to understand that they can speak freely without fear of repercussion. The art of

communication tends to put the stress on talking, but listening is equally important. Great cultures grow around people who listen e.g., what is the market saying? What developments, trends and calamities are going on?

(iii) *Replace the Whiners.* A culture of passion capital can be compromised by the wrong people. One of the most destructive corporate weeds is the whiner. They don't stand up in meetings and think that everything is wrong with the company. Instead, they move through the organisation, speaking privately, sowing doubt and strangling passion. Constructive criticism is healthy, but relentless complaining is toxic. Identify these people and replace them.

(iv) *Reward Hard Workers.* In the global economy we can understand who is leading in productivity on account of superior work ethics. Many industries thrive on more than forty eight hour work per week. A culture where everyone understands that long hours of work are sometimes required will work, if this sacrifice is recognized and rewarded.

(v) *Be Ambitious.* Ambition is sometimes seen as a negative attitude these days, but without it we would stagnate. We need a culture that supports big steps and powerful beliefs.

(vi) *Celebrate Diversity.* Great cultures are built on a diversity of background, experience, and interests. These differences generate energy, which is critical to any enterprise.

(vii) *Create the Space.* The organisations should design spaces where people from different disciplines can come together, whether in workspace or in common leisure space. Reasoning is simple i.e., it is this interaction that helps breed revolutionary ideas. Create a free atmosphere and engineer chat over coffee. Let HR and marketing people bump into one another in the fitness center. Culture is made in the physical space. Look at your space to promote interaction and connectivity.

(viii) *Take the Long View.* If your work culture is dependent on this quarter's earnings or this month's sales targets, then it is handicapped by short-term thinking. We tend to overestimate what we can do in a year, but underestimate what we can do in five years. The culture needs to look ahead, not just in months but in years and even decades.

SUMMARY

- Work Culture in any organisation includes the organisation's vision, values, norms, systems, symbols, language, assumptions, beliefs and habits. Organisational culture may affect, how much employees identify themselves with their organisation and are satisfied with their job. There are two types of work cultures i.e., (i) strong culture and weak culture. In a strong culture, employees have a sense of empowerment and understanding of the company goals, regulations and philosophy, and (ii) weak organisational culture, wherein employees are lost, unmotivated and operate under a regime of fear. In order to increase productivity, growth, efficiency and reduce counterproductive behaviour, organisations should strive for what is considered a "healthy" organisational culture which includes; appreciation, fair treatment of each employee, Employee's pride and enthusiasm, Equal opportunity, Strong communication, Strong company leaders, Ability to compete in industry, Higher turnover, and Investment in learning. There are many different types of cultures that develop within a company. Some companies practice with more than one of these and some are strictly one of the following; (i) Academic Culture, (ii) Normative

Culture, (iii) Pragmatic Culture, (iv) Club Culture (i.e., Nothing but the best), (v) Sports Team Culture, (vi) Fortress Culture, (vii) Expectations Culture, (viii) Process Culture, and (ix) Bet Culture. For creating the right conditions for a good organisational work culture the company should ; (i) Hire the Right People, (ii) Communicate with employees, (iii) Replace the Whiners, (iv) Reward Hard Workers, (v) Be Ambitious, (vi) Celebrate Diversity, (vii) Create the space, and (viii) Take the long view.

Short Question Answers

1. Differentiate between strong culture and weak culture.

Ans. There are two overarching models that companies will fall into i.e., strong culture and weak culture. In a strong culture, employees have a sense of empowerment and understanding of the company goals, regulations and philosophy. This kind of culture allows employees to be driven and feel respected which benefits the overall health of a company. In a weak organisational culture, employees are lost, unmotivated and operate under a regime of fear. Fear may motivate individuals but not for long and for all of the wrong reasons. Employees should never feel that they will be wrongly reprimanded for making mistake or for needing a little extra guidance.

2. Describe the benefits of a strong culture in an organization.

Ans. A strong culture is said to exist in an organisation where staff responds to stimulus because of their alignment to organisational values. In such environments, strong cultures help firms operate like well-oiled machines, engaging in outstanding execution with only minor adjustments to existing procedures as needed. Conversely, where there is weak culture there is little alignment with organisational values, and control must be exercised through extensive procedures and bureaucracy. Where work culture is strong, people do work because they believe it is the right thing to do.

3. What is healthy work culture, define ?

Ans. A work culture which increases productivity, growth, efficiency and reduces counter productive behaviour is considered a "healthy" organisational culture.

4. State and explain in brief the types of work culture in organisations.

Ans. Some organisational work cultures are ; (i) Academic Culture, (ii) Normative Culture, (iii) Pragmatic Culture, (iv) Club Culture (i.e., Nothing but the best), (v) Sports Team Culture, (vi) Fortress Culture, (vii) Expectations Culture, (viii) Process Culture, and (ix) Bet Culture.

Exercise

1. What do you understand by the term "Work Culture" in any organization ?
2. Describe characteristics of healthy work culture.
3. Describe in brief the rules for creating good organizational work culture.
4. If you are an entrepreneurs which type of or combination of work culture would you like to adopt and why ?



4.4 FEELING OF JOB SATISFACTION

Every day in the newspapers we find hundreds of advertisements on vacancies in various companies/offices/organizations within and outside the country. These advertisements contain some details and description about the salary, bonus, future promotion prospects, job location and facilities and perks provided like residential accommodation, club, Gym, transport, medical, children education etc. Every person is unique in what he/she wishes to achieve from his/her work, but there are some job satisfaction factors that psychologists usually agree upon. Actually the details mentioned in the advertisements indicate the direct factors which give job satisfaction to a person. We will briefly discuss these and other indirect factors responsible for job satisfaction.

An employee's overall satisfaction with his job is the result of a combination of above said factors and most important of all is the financial compensation. Management's role in enhancing employees' job satisfaction is to make sure the work environment is positive, morale is high and employees have the resources they need to accomplish the tasks they have been assigned, by keeping an eye on the following points :

(i) **Job Security.** Everybody wants a secure job for the security of his/her family and dependents however, job security is rapidly becoming a thing of the past. Most people will have many jobs over the course of their working lives. What job security means today is that you have strong transferable skills and knowledge that you can bring with you to each new job therefore one should plan to develop solid reading, math, technical and thinking skills.

(ii) **Working Environment.** Few workplaces are exactly as we want them to be but a poor work environment can make us hate getting up in the morning. Is the workplace comfortable? How are the ventilation, lighting and temperature? Is there adequate privacy? Is it attractive and welcoming? Is it conducive to work? Employees spend much of the time in their work environment, it's important for companies to try to optimize good working conditions. Provision of things such as providing spacious work areas rather than cramped ones, adequate lighting and comfortable work stations contribute to favourable work conditions. Providing productivity tools such as upgraded information technology to help employees accomplish tasks more efficiently contributes to job satisfaction as well.

(iii) **Workload and Stress Level.** A heavy workload can lead to stress and burnout, on the other hand, a light workload can be totally boring and unsatisfying. Of course there will be more and less intense periods with every job but over a long period you want to have a balance. A good job will give you enough work to keep you productive and challenged and yet not so much that you feel you're being taken advantage of. Dealing with a workload that is far too heavy and deadlines that are impossible to reach can cause job satisfaction to erode for even the most dedicated employee. Falling short of deadlines results in conflict between employees and supervisors and raises the stress level of the workplace. Many times, this

environment is caused by ineffective management and poor planning. The office operates in a crisis mode because supervisors don't allow enough time for employees to perform their assigned tasks effectively or because staff levels are inadequate.

(iv) **Opportunity for Advancement.** Employees are more satisfied with their current job if they see a path available to move up the ranks in the company and be given more responsibility and along with it higher compensation. Many companies encourage employees to acquire more advanced skills that will lead to the chance of promotion. For example, companies often pay the cost of tuition for employees taking university courses. During an employee's annual performance review, a supervisor should map out a path showing his/her what he/she needs to accomplish and what new skills he/she needs to develop in order to be on a track to advancement within the organization. Management should reward achievements with increased responsibility with opportunities for growth or promotion. Lack of opportunity can be frustrating and demoralizing.

(v) **Interpersonal Relations.** Good relationships in the workplace are essential ingredients of a good job. The workplace is a social environment. Employees are happier and do better when there is a sense of teamwork and camaraderie. When employees get along and work well together, there is higher turnover, less friction and better performance. Employees seek to be treated with respect by those, they work with. A hostile work environment with rude or unpleasant co-workers is one that usually has lower job satisfaction. Managers need to step in and mediate conflicts before they escalate into more serious problems requiring disciplinary action. Employees may need to be reminded what behaviours are considered inappropriate when interacting with co-workers.

(vi) **Recognition.** Effective managers know their employees need recognition and praise for their efforts and accomplishments. A good company will not take much time to acknowledge and appreciate employee efforts, especially when an employee goes above and beyond the job description. This may be making a suggestion that saves the company money, streamlining a procedure or helping the company exceed production or sales quotes. It can also mean doing what you were hired to do taking pride in your work, being friendly and doing your job consistently well. Employees also need to feel that their supervisor's door is always open for them to discuss any concerns they have that are affecting their ability to do their jobs effectively and harming their satisfaction at the office.

(vii) **New Technologies.** Companies that use cutting edge technology provide you with new challenges, new skills and new experiences that you take along your career path. Having to juggle along with insufficient resources and aging technology can be difficult and draining. A job that doesn't stretch you can lead to frustration and dissatisfaction. If you're bored, resentful and unhappy you are not doing yourself or your employer much good.

(viii) **Interesting Projects.** Working on interesting projects can be greatly rewarding. When you work with a motivated group of people on a project that is meaningful to you e.g., organising a major event, building a bridge, launching a new product, helping out in a natural

disaster, it is an opportunity to build new skills and to establish yourself as a team player who can contribute under pressure.

(ix) **Flexibility.** The office environment is expanding beyond the building walls. Workers belonging to the same work team may be from different states or even different countries. The standard 9-5 work day isn't suited to everyone or to every situation. Check out the possibilities for flexible working hours or online working from home or a site away from office.

(x) **Ability to Influence Decisions.** Having a real say in the decision making process can be personally satisfying which contributes to your sense of involvement and identification with the company. When you contribute, people notice and opportunities open up.

(xi) **Financial Benefits.** Job satisfaction is impacted upon by the employee's views about the fairness of the company wage scale, as well as, the current compensation he/she may be receiving. Companies need to have a mechanism in place to evaluate employee performance and provide salary increase to top performers. Opportunities to earn special incentives, such as bonuses, extra paid time off or vacations, also bring excitement and higher job satisfaction to the workplace. A good salary may not look so great once you consider the cost of insurance, health care and retirement savings etc. A good benefits package can more than make up for a lower salary.

SUMMARY

- ◆ For a job satisfaction, every person is unique in what he/she wishes to achieve from his/her work e.g., salary, bonus, future promotion prospects, job location and facilities and perks provided like residential accommodation, club, Gym, transport, medical, children education etc. Management's role in enhancing employees' job satisfaction is to make sure the work environment is positive, morale is high and employees have the resources they need to accomplish the tasks they have been assigned. There are some job satisfaction factors that psychologists usually agree upon : (i) Every employee should feel his job secure for the security of his/her family and dependents, (ii) it's important for companies to try to optimize good working conditions because adequate lighting and comfortable work stations contribute to favourable work conditions for the employees, (iii) A balanced job will keep employees productive and challenged and yet not so much that they feel that they are being taken advantage of, (iv) Management should reward achievements with increased responsibility and opportunities for growth or promotion, (v) Good relationships in the workplace are essential ingredients of a good job, (vi) employees need recognition and praise for their efforts and accomplishments, (vii) cutting edge technology provides employees with new challenges, new skills and new experiences that take them ahead in their career path, (viii) working with a motivated group of people on a project is an opportunity to build new skills and to establish employees as a team player, (ix) Check out the possibilities for flexible working hours or online working from home or a site away from office, (x) Employees having a real say in the decision making process can be personally satisfying, and (xi) Companies need to have a mechanism in place to evaluate employee performance and provide salary increase to top performers.

Short question answers

1. **What are Job Satisfaction factors for an employee ?**
Ans. In any job provision of salary, bonus, future promotion prospects, job location and facilities and perks provided like residential accommodation, club, Gym, transport, medical, children education etc. are the main factors for the job satisfaction of employees.
2. **How do you feel that job security and financial benefits are primarily most important ?**
Ans. Ans. Everybody wants a secure job for the security of his/her family and dependents. Job security means today that you have strong transferable skills and knowledge that you can bring with you to each new job. Job satisfaction is impacted upon by the employee's views about the fairness of the company wage scales, as well as, the current compensation he/she may be receiving.
3. **How are opportunities for advancement and provision of new technologies are interrelated and important job satisfaction ?**
Ans. Employees are more satisfied with their current job if they see a path available to move up the ranks in the company along with higher compensation. Management should use cutting edge technology and provide them with new challenges and new skills and reward achievements with increased opportunities for growth or promotion. Lack of opportunity can be frustrating and demoralizing.
4. **What points should the management keep an eye to enhance employees job satisfaction.**
Ans. By keeping an eye on the following points management can enhance employees' job satisfaction i.e.,
 - (i) Feeling of Job Security, (ii) Good Working Environment,
 - (iii) Check on Workload and Stress Level, (iv) Provide Opportunity for Advancement,
 - (v) Good Interpersonal Relations of Employees,
 - (vi) Recognition of Talent, (vii) Provide New Technologies,
 - (viii) Interesting Projects, (ix) Working Flexibility,
 - (x) Employees Ability to Influence Decisions, and
 - (xi) Provide Attractive Financial Benefits.

Exercise

1. What is management's rule in enhancing employees job satisfaction ?
2. How are interpersonal relations and working environment affect the job satisfaction of an employee ?
3. Recognition and appreciation of efforts and accomplishments of employees boosts their moral to do better production, justify.



4.5 NATIONAL INTEGRATION

In the words of Nehru the Indian state is based on the principle of unity in diversity. Each nation has its own boundary and set of rules. Therefore, a nation can be treated as a community. Nation constitutes the largest community among all the groups of man. National integration is the awareness of a common identity amongst the citizens of a country. It means that though we belong to different castes, religions and regions and speak different languages we recognize the fact that we are all one. This kind of integration is very important in the building of a strong and prosperous nation.

4.5.1 Unity in Diversity

A unique feature of our country is that all the major religions of the world are practiced here like Hinduism, Islam, Christianity, Buddhism, Sikhism, Jainism, and Zoroastrianism etc. There are also great varieties in costume, food habits, and social customs, community etc. There are also great varieties in costume, food habits, and social customs. Geographically our land is diverse and there are amazing differences in climate. Despite all these differences India is a political entity, every part of which is governed under the same Constitution. But what the 'community' means according to sociology is a group of people who inhabit a region by mingling with each other. There is no territorial limit in community. That is the major difference between society and community. Unity in our country does not mean the kind of oneness that comes from racial and cultural similarity. It is unity in spite of great differences, in other words, unity in diversity. Each group of people follows its own culture. By culture is meant the sum total of what exists in a society with regard to dress, language, customs, practices and beliefs. The culture which exists in India is multicentric but, it is these elements of culture that unite India. That is the reason why the principle "unity in diversity" suits Indian society and culture.

India is a very large country. We have the second largest population in the world and our land area is of quite big size. About one thousand six hundred fifty-two languages and dialects are spoken in our country out of which eighteen languages have been given special recognition by our Constitution as National languages of our country. We have to co-exist with each other peacefully, respect the culture and religion of our fellow Indians.

4.5.2 Factors Harming National Integration

There are many factors that come in the way of our national integration. Often people have very strong feelings about their own caste, religion and language and oppose those of others. Such feelings lead to clashes between different sects. Such occurrences damage our unity and prove to be a hindrance to our progress.

Communalism is one factor that poses a great danger to our unity. The formation of the State of Pakistan in 1947 led to terrible communal riots. A very large number of people lost their lives and their homes and had to undergo a lot of suffering to resettle. The British had encouraged communalism because a division between Hindus and Muslims made it easier for

them to control our country. Unfortunately, even with the passage of time these communal feelings have not ended. More than fifty years after independence communal feelings still exist and riots flare-up even now in different parts of the country. It is the result of narrow-mindedness, prejudice, and lack of knowledge of other religions by few people. This is also because of the exploitation of such feelings by some politicians to further their interests. If we give more importance to our religion rather than our country we cannot contribute to its progress and development. We have to develop tolerance and understanding for other religions and not let such feelings destroy our unity.

Linguistic differences also create problems. Our Constitution has given recognition to eighteen languages. This is something important in a country such as ours. One's mother tongue is dear to each and every one. It is also essential to impart education in the mother tongue for quick and easy learning. This also helps a language to develop and grow. Hindi and English act as link languages between States in our country. Sometimes people display hostility towards the language of other people. This again harms the cause of our national unity. As responsible citizens we must give due respect to other languages and cultures and realize that they add to the greatness of our country.

Casteism also poses a great threat to our unity. People of one caste support each other and oppose the progress and development of people belonging to other castes. Appointments in jobs, admissions in educational institutions are often on the basis of caste considerations. People also avoid social interaction with other castes. Politicians often exploit such feelings at the time of elections. This leads to feelings of resentment and hostility that threaten the integrity of our country.

4.5.3 National Integration Promoting Factors

Being aware that there were threats to our unity from various forces, our forefathers placed certain safeguards in our Constitution which took the form of certain ideals and principles like Democracy, Secularism, and Social Equality guaranteed under our Fundamental Rights. Thus, our **Constitution** is the most important force that promotes national integration.

Secularism. India is a secular state. This means that each citizen of our country has the right to practice his or her religion. The government cannot show preference to one religion at the expense of another.

Democracy. As a democratic state all the citizens of India are equal under the law of the country. Our Fundamental Rights and Directive Principles of State Policy specifically state that each citizen is equal in every way. People cannot be discriminated against on the basis of differences of caste, religion, language, and culture.

National Festivals. They act as an important unifying force. Independence Day, Republic Day, and Gandhi Jayanti are festivals that are celebrated by all Indians and in all parts of the country, regardless of language, religion or culture. They remind us of our common nationality.

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Five Year Plans. for economic development are made for our country as a whole. The Central and State Governments are working together to achieve these common objectives. Different regions of the country are dependent on each other for supplying and consuming various kinds of products that result in their economic growth. Wheat grown in Punjab may be sold in Tamil Nadu and cotton textiles from Gujarat may be sold in Bihar. No region is so self-sufficient that it can do without the other. These factors also bind the country together. We all grow economically together as a nation.

National Symbols. like the National Flag, the National Anthem, and the National Emblem also help to remind us of unity in diversity. For this reason we stress on the importance of showing proper respect to these symbols. These act as strong unifying forces both in times of celebration and adversity.

"At present, the identification is on the basis of state, language, religion, caste and culture but not at all on the basis of country. To achieve the goal of national integration, every citizen of India must first identify himself or herself as Indian but, not as Bengali, Punjabi, south Indian or north Indian. National integration is actually a harmonious situation that binds the people of India together. The nation is built by its people so all the people must live in unity for the development of the nation as a whole. Being an Indian is our common identity and we must say it proudly."

SUMMARY

◆ National integration is the awareness of a common identity amongst the citizens of a country. A unique feature of our country is that all the major religions of the world are practiced here. We have to co-exist with each other peacefully, respect the culture and religion of our fellow Indians. There are many factors that come in the way of our national integration (e.g., (i) Communalism is one factor that poses a great danger to our unity, (ii) Linguistic differences, and (iii) Casteism. Our Constitution is the most important force that promotes national integration. Our forefathers placed certain safeguards in our Constitution which took the form of certain ideals and principles like Democracy, Secularism, and Social Equality guaranteed under our Fundamental Rights. At present, the identification is on the basis of state, language, religion, caste and culture but not at all on the basis of country. To achieve the goal of national integration, every citizen of India must first identify himself or herself as Indian but, not as Bengali, Punjabi, south Indian or north Indian. Being an Indian is our common identity and we must say it proudly.

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Short Question Answers

1. Define the term "National Integration".
Ans. National integration is the awareness of a common identity amongst the citizens of a country. It means that though we belong to different castes, religions and regions and speak different languages we recognize the fact that we are all one.
2. How and why do we say that India has unity in its diversity ?
Ans. A unique feature of our country is that all the major religions of the world are practiced here like Hinduism, Islam, Christianity, Buddhism, Sikhism, Jainism, and Zoroastrianism community etc. There are also great varieties in costume, food habits, and social customs. Geographically our land is diverse and there are amazing differences in climate. Despite all these differences India is a political entity, every part of which is governed under the same Constitution.
3. Explain in very short, the method to achieve national integration by every citizen of India.
Ans. At present, the identification is on the basis of state, language, religion, caste and culture but not at all on the basis of country. To achieve the goal of national integration every citizen of India must first identify himself or herself as Indian but, not as Bengali, Punjabi, south Indian or north Indian. National integration is actually a harmonious situation that binds the people of India together. The nation is built by its people so all the people must live in unity for the development of the nation as a whole. Being an Indian is our common identity and we must say it proudly.

Exercise

1. How is communalism and casteism harming the national Integration of our country ?
2. The social linguistic differences create problem, is it true in the context of India ?
3. It is invariably said that secularism and democracy are two pillars of our constitutions for promoting national integrations, explain.
4. How do the national festivals and national symbols help our national integration ?

4.6 LIFE OF ILLUSTRIOS PROFESSIONALS

4.6.1 Dr. A.P.J. Abdul Kalam

Dr. A.P.J. Abdul Kalam (Avul Pakir Jainulabdeen Abdul Kalam), an Aerospace engineer, is India's most distinguished scientist known as "Missile man of India". He served as the 11th President of India from 25 July, 2002 to 24 July, 2007. During his term as President, he was popularly known as the People's President. Kalam was the third President of India to have been honoured with India's highest civilian honour, the Bharat Ratna.

Dr. Abdul Kalam was born on 15 October 1931 in a Muslim family in Tamil Nadu. He came from a poor background. His father Jainulabdeen was a boat owner, at Rameswaram. He started working at an early age by distributing newspapers to financially contribute and supplement his family's income. After completing his school education at the Ramanathapuram Schwartz Matriculation School, Kalam went on to attend Saint Joseph's College, Tiruchirappalli, affiliated with the University of Madras, from where he graduated in physics in 1954. He got his degree in "Aeronautical Engineering" from the Madras Institute of Technology in 1958. Thereafter he joined Defence Research and Development Organization (DRDO). In 1962, Dr. Abdul Kalam joined the Indian Space Research Organisation (ISRO), where he and his team launched several satellites successfully. He made a significant contribution as Project Director to develop India's first indigenous Satellite Launch Vehicle (SLV-III). Kalam was also director of two projects, which sought to develop ballistic missiles from the technology of the successful SLV programme. For these aerospace projects, the then Prime Minister Indira Gandhi allotted secret funds through her discretionary powers under Kalam's directorship. Kalam played a major part in developing many missiles including Agni, an intermediate range ballistic missile and Prithvi, the tactical surface-to-surface missile. He was the Chief Scientific Adviser to the Prime Minister and the Secretary of Defence Research and Development Organisation from July 1992 to December 1999. The Pokhran-II nuclear tests were conducted during this period where he played an intensive technological role. Kalam served as the Chief Project Coordinator, along with R Chidambaran during the testing phase. His book India 2020 strongly advocates an action plan to develop India into a knowledge superpower with a view that India ought to take a more assertive stance in international relations. He regards his work on India's nuclear weapons program as a way to assert India's place as a future superpower.

Controversy surrounds Kalam's role as a nuclear scientist is the lack of reliable and factual reporting of the yield of Pokhran-II tests. The director of the site test, K Santhanam, publicly admitted that the thermonuclear bomb was a "fizzle" test, criticizing Kalam for issuing the wrong report. However, Kalam dismissed the claims and R Chidambaram, a key associate of Pokhran-II, also described these claims as incorrect.

Kalam continued to take an active interest in other developments in the field of science and technology as well. He is a supporter of open source software over proprietary solutions

and believes that the use of open source software on a large scale will bring people more interest in the spheres of India's science and technology.

Kalam was criticised by civil groups over his stand on the Koodankulam Nuclear Power Plant, where he supported setting up of the nuclear power plant. He was perceived to be a pro-nuclear scientist and people were unimpressed by the assurance provided by him on the safety features of the plant. In his last years of Presidency Kalam was also criticised for inaction in deciding the fate of 20 out of the 21 mercy petitions. Constitution of India empowers the President of India to grant pardon, suspend and remit death sentences and commute the death sentence of convicts on death row.

He was a visiting professor at Indian Institute of Management Shillong, Indian Institute of Management Ahmedabad and Indian Institute of Management Indore, honorary fellow of Indian Institute of Science, Bangalore, Chancellor of the Indian Institute of Space Science and Technology, Thiruvananthapuram, a professor of Aerospace Engineering at Anna University (Chennai), JSS University (Mysuru) and an adjunct/visiting faculty at many other academic and research institutions across India.

Dr. Kalam observed strict personal discipline, practicing vegetarianism, teetotalism and celibacy. Kalam has written several inspirational books, most notably his autobiography Wings of fire, aimed at motivating Indian youth. Another of his books guiding Souls: Dialogues on the purpose of Life reveals his spiritual side.

SUMMARY

- ◆ Dr. A.P.J. Abdul Kalam (Avul Pakir Jainulabdeen Abdul Kalam), an Aerospace engineer, is India's most distinguished scientist known as "Missile man of India". He served as the 11th President of India from 25 July, 2002 to 24 July, 2007. Kalam was born on 15 October 1931 in a poor boat owner's Muslim family in Tamil Nadu. He graduated in physics in 1954 and got "Aeronautical Engineering" degree in 1958. Thereafter he joined Defence Research and Development Organization (DRDO). In 1962, Dr. Abdul Kalam joined the Indian Space Research Organisation (ISRO). He made a significant contribution as Project Director in development of India's first indigenous Satellite Launch Vehicle (SLV-III). Kalam played a major part in developing many missiles including Agni, an intermediate range ballistic missile and Prithvi, the tactical surface-to-surface missile. He was the Chief Scientific Adviser to the Prime Minister and the Secretary of Defence Research and Development Organisation from July 1992 to December 1999. The Pokhran-II nuclear tests were conducted during this period which were surrounded in Controversy that the thermonuclear bomb was a "fizzle" test, however it was told to be untrue by Dr. Kalam.

Short Question Answers**1. Who is Dr. Abdul Kalam ?**

Ans. Dr. A.P.J. Abdul Kalam (Avul Pakir Jainulabdeen Abdul Kalam), an Aerospace engineer, is India's most distinguished scientist known as "Missile man of India". He served as the 11th President of India from 25 July, 2002 to 24 July, 2007.

2. State the controversies surrounding Abdul Kalam.

Ans. (i) The Pokhran-II nuclear tests conducted were surrounded in Controversy that the thermonuclear bomb was a "fizzle" test, however it was told to be untrue by Dr. Kalam.

(ii) Kalam was criticised for being perceived as a pro-nuclear scientist by civil groups over his stand on the Koodankulam Nuclear Power Plant.

(iii) In his last years of Presidency Kalam was also criticised for inaction in deciding the fate of 20 out of the 21 mercy petitions.

Exercise

- What qualifications were acquired by APJ Abdul Kalam ?
- Describe Dr. APJ Abdul Kalam's contribution to the scientific development of India.
- Describe Abdul Kalam's life, post his retirement.

4.6.2 Dr. Sam Pitroda

Satyanarayan Gangaram Pitroda is popularly known as Dr. Sam Pitroda. He is an inventor, entrepreneur and policymaker and better known as "The father of India's communication revolution". Presently besides being the chairman and CEO of World-Tel Limited and the founder and CEO of C-SAM, Inc. he is also the Chairman of India's National Knowledge Commission. He also worked as an advisor to the United Nation in 1992.

Satyanarayan Gangaram Pitroda was born on 16th November 1942 in Titlagarh, Odisha, India, to parents from Gujarat. He had seven siblings and is third oldest among them. The family was deeply influenced by Mahatma Gandhi and his philosophy. Consequently, Pitroda and his brother were sent to Gujarat to imbibe Gandhian philosophy. He completed his schooling from Vallabh Vidyanagar in Gujarat and completed his Master's degree in Physics and Electronics from Maharaja Sayajirao University in Vadodara. After completing his Masters in Physics in the year 1964 he went to the US and obtained a Masters in Electrical Engineering from the Illinois Institute of Technology in Chicago. Throughout the late 1960s and early 1970s Pitroda was involved in technology research work in telecommunications and hand-held computing. In 1966 he went to work for GTE in Chicago.

In 1974, Pitroda joined "Wescom Switching" which was one of the first digital switching companies. He developed the 580 DSS switch, over in nearly four years. Wescom was acquired by Rockwell International in 1980, where Pitroda became vice president. During his four decades as an engineer, Pitroda filed scores of patents in telecommunications. The latest set of patents relate to mobile phone based transaction technology, both financial and non-financial, via mobile phones. He is regarded as one of the earliest pioneers of hand-held computing because of his invention of the Electronic Diary in 1975.

When we think about yellow phone booths all across India, we must remember Sam Pitroda. For this facility to public, totally credit goes to Sam Pitroda. It is interesting to know that Sam Pitroda first used a telephone only after moving to the US. The biggest virtue of Sam Pitroda is that he has a definite vision to use technology for the benefit and betterment of society. Along with being a pioneer in telecom, Sam Pitroda has made strong case for food, clean water, and adequate shelter for the unprivileged section. Due to his hard work, Sam Pitroda has brought telephones to some of the worlds previously isolated regions. In the field of telecom, Sam's emphasis was on accessibility rather than density. By providing public access to telephones, Mr. Sam Pitroda revolutionized the state of telecommunications in India.

Sam Pitroda was involved in research work on telecommunications and handheld computing, and has many technology patents to his name. He introduced microprocessor in telephone switches leading to digital switching and invented the Electronic Diary in 1975. He designed his own computer-themed card game called Compucards in 1983. He returned to India in 1984 on the suggestion of the then Prime Minister Mrs. Indira Gandhi and founded the Centre for Development of Telematics (C-DOT). In 1987, he became advisor to the then Prime Minister Rajiv Gandhi and was responsible for revolutionizing India's foreign and domestic telecommunications policies. He is widely known as the brain behind the introduction of the Public Call Offices (PCO) across the length and breadth of the country. In the 1990s Pitroda returned to Chicago to resume his business interests. In May 1995, he became the first chairman of World Tel initiative of the International Telecommunication Union. When the United Progressive Alliance government came to power following the 2004 General Elections, Prime Minister Manmohan Singh invited him to head the National Knowledge Commission of India. In July 2009, the Government of India invited Mr. Sam Pitroda to head an expert committee on ICT in Railways. In October 2009, Sam Pitroda was appointed as Advisor to Prime minister of India (Dr. Manmohan Singh) on Public Information Infrastructure and Innovations with the rank of Cabinet Minister. He has been awarded the Padma Bhushan award in 2009 by the Government of India for his contribution to Science and Engineering. In August 2010, Pitroda was appointed chairman of National Innovation Council. Pitroda contributed to India's foreign and domestic telecommunications policies.

Awards

- ❖ Dataquest gave Pitroda a lifetime achievement award in 2002.
- ❖ IEEE Communication Society, Award for Public Service in the Field of Telecommunications in 2007.
- ❖ In 2008, Pitroda was elected as a world prominent leader by the World Network of Young Leaders and Entrepreneurs.
- ❖ Andhra University honored Pitroda with D.Sc in 2008.
- ❖ The Skoch Challenger Lifetime Achievement Award in 2009 for ushering in the telecom and IT revolution in India.
- ❖ Padma Bhushan in 2009 by the Government of India for his contribution to Science and Engineering.
- ❖ He was felicitated on 31 March 2009 by Akhila Bharatiya Viswakarma Mahasabha (ABVM) for service to the viswakarma community.
- ❖ In May 2010, the University of Illinois at Chicago College of medicine presented him an honorary degree.
- ❖ Sambalpur University honored Pitroda with D.Sc. on its 23rd convocation on 14 July 2010.
- ❖ International Telecommunication Union (ITU) conferred the World Telecommunication and Information Society Award to Pitroda in Geneva on 17 May 2011. He was awarded in recognition of his dedication to promoting information, communication and technology as a means of providing a better life for humanity and social and economic empowerment. He was the first Indian to receive this award.

SUMMARY

❖ Satyanarayan Gangaram Pitroda popularly known as Dr. Sam Pitroda is an inventor, entrepreneur and policymaker and better known as "The father of India's communication revolution". He developed the 580 DSS switch and filed scores of patents in telecommunications. He invented the Electronic Diary in 1975. Sam Pitroda has brought telephones to some of the world's previously isolated regions. When we think about yellow phone booths all across India, we must remember Sam Pitroda. In 1987, he became advisor to the Prime Minister of India and was responsible for revolutionizing India's foreign and domestic telecommunications policies. In May 1995, he became the first chairman of World Tel initiative of the International Telecommunication Union. In October 2009, Sam Pitroda was appointed as Advisor on Public Information Infrastructure and Innovations with the rank of a Cabinet Minister. He has received many awards including the Padma Bhushan award in 2009 by the Government of India for his contribution to Science and Engineering.

Short Question Answers**1. Who is Dr. Sam Pitroda ?**

Ans. Satyanarayan Gangaram Pitroda is popularly known as Dr. Sam Pitroda. He is an inventor, entrepreneur and policymaker and better known as "The father of India's communication revolution". Presently he is chairman and CEO of World-Tel Limited and the founder and CEO of C-SAM, Inc.

2. Why is Sam Pitroda called "the father of communication revolution in India" ?

Ans. Sam Pitroda was involved in research work on telecommunications and handheld computing, and has many technology patents to his name. He introduced microprocessor in telephone switches leading to digital switching and invented the Electronic Diary in 1975. He designed his own computer-themed card game called Compucards in 1983. He was responsible for revolutionizing India's foreign and domestic telecommunications policies. He is widely known as the brain behind the introduction of the public Call Offices (PCO) across the length and breadth of the country.

3. Write the various senior Govt. jobs held by Sam Pitroda.

- Ans. (i) In 1987, he became advisor to the then Prime Minister Rajiv Gandhi.
(ii) In 2004, Prime Minister Manmohan Singh invited him to head the National Knowledge Commission of India.
(iii) In July 2009, the Government of India invited Mr. Sam Pitroda to head an expert committee on ICT in Railways.
(iv) In October 2009, Sam Pitroda was appointed as Advisor to Prime minister of India on Public Information Infrastructure and Innovations with the rank of Cabinet Minister.

Exercise**1. Describe Sam Pitroda's family background and his education.****2. Describe in brief Sam Pitroda's Contribution in Computers.****3. Write the awards given to Sam Pitroda in Communication.**

4.6.3 Dr. Har Gobind Khurana

Hargobind Khurana was born on January 9, 1922 in a small village of Raipur, Punjab (Pakistan). His father was the village patwari. He completed his secondary education from D A V High School in Multan, (Pakistan). He obtained his B.Sc. and M.Sc. degree from Punjab University at Lahore. Then he went to England on a Government scholarship and there he obtained a PhD from the University of Liverpool in 1948. Dr. Khurana spent an year in Zurich in 1949 as a post-doctoral fellow at the Swiss Federal Institute of Technology. He returned to England in 1950 and spent two years on a fellowship at Cambridge, and began research on nucleic acids under Sir Alexander Todd and Kenner. His interest in proteins and nucleic acids took root at that time. In 1952, he went to the University of British Columbia, Vancouver on a job offer and there a group began to work in the field of biologically interesting phosphate esters and nucleic acids. When he returned to his native place, he was unable to find academic work in Punjab's crony-filled colleges. Khurana instead sought a career in Canada and finally the United States.

Hargobind Khurana was an India born American famous as a molecular biologist. In 1968, He was awarded the Nobel Prize in Physiology of Medicine for his excellent work on the interpretation of the genetic code and its function in protein synthesis. This award made him famous all over the world. Khorana and his team had established that the mother of all codes, the biological language common to all organisms, is spelled out in three-letter words: each set of three nucleotides codes for a specific amino acid. Their Nobel lecture was delivered on December 12, 1968. Khurana was the first scientist to chemically synthesize oligonucleotides.

He extended the above to long DNA polymers using non-aqueous chemistry and assembled these into the first synthetic gene, using polymerase and ligase enzymes that link pieces of DNA together, as well as methods that anticipated the invention of PCR. These custom-designed pieces of artificial genes are widely used in biology labs for sequencing, cloning and engineering new plants and animals, and are integral to the expanding use of DNA analysis to understand gene-based human disease as well as human evolution. Khurana's invention(s) have become automated and commercialized so that anyone now can order a synthetic gene from any of a number of companies. One merely needs to send the genetic sequence to one of the companies to receive an oligonucleotide with the desired sequence.

Since the middle of the 1970s, his lab studied the biochemistry of bacteriorhodopsin, a membrane protein that converts light energy into chemical energy by creating a proton gradient. Later, his lab went on to study the structurally related visual pigment known as rhodopsin. Dr. Khurana who showed how the genetic code determines all life processes by directing the synthesis of all cell proteins finally unravelled the secret of the DNA code of life. Khurana's work, which is a most important scientific landmark of the twentieth century, has brought closer the day when synthetic DNA may be introduced into the defective human tissues to bring about their repair or treat mentally retarded people and change them into more intelligent and healthy human beings. His synthesis of RNA, capable of replication in laboratory, is a step towards the creation of life artificially. In fact, the research has opened up a new branch called Genetic Engineering in Science.

Dr. Khurana won many awards and honours like the Nobel Prize for his achievement. Distinguished Service Award, Watumull Foundation, Honolulu, Hawaii, American Academy of achievement awards, Philadelphia, Pennsylvania, Padma Vibhushan, Presidential Award, J C Bose Medal and Willard Gibbs medal of the Chicago section of American Chemical Society. He was also elected a member of the National Academy of Sciences, Washington, as well as a Fellow of the American Association for the Advancement of Science. In 1971, he became a foreign member of USSR Academy of Sciences and in 1974, an Honorary Fellow of the Indian Chemical Society.

The University of Wisconsin-Madison, the Government of India (Department of Biotechnology), and the Indo-US Science and Technology Forum jointly created the Khorana Program in 2007. The mission of the Khorana Program is to build a seamless community of scientists, industrialists, and social entrepreneurs in the United States and India. The program is focused on three objectives: Providing graduate and undergraduate students with a transformative research experience, engaging partners in rural development and food security, and facilitating public-private partnerships between the U.S. and India. Dr. Har Gobind Khurana breathed his last at the age of 89 years while living in the U.S.A.

SUMMARY

♦ Hargobind Khurana was an India born American famous as a molecular biologist. He was born on January 9, 1922 in a small village of Raipur, Punjab (Pakistan). He obtained his B.Sc. and M.Sc. degree from Punjab University at Lahore. Then he went to England on a Government scholarship and there he obtained a PhD from the University of Liverpool in 1948. In 1968, he was awarded the Nobel Prize in Physiology of Medicine for his excellent work on the interpretation of the genetic code and its function in protein synthesis. In fact, the research has opened up a new branch called Genetic Engineering in Science. Apart from Nobel Prize Dr. Khurana won many awards like the Distinguished Service Award, Watumull Foundation, Honolulu, Hawaii, American Academy of Achievement awards, Philadelphia, Pennsylvania, Padma Vibhushan, Presidential Award, J C Bose Medal and Willard Gibbs medal of the Chicago section of American Chemical Society. Dr. Har Gobind Khurana breathed his last at the age of 89 years while living in the U.S.A.

Short Question Answers

1. Describe the childhood and later on acquisition of various qualification and fellowships by Har Gobind Khurana.



2. Describe how and why was Har Gobind Khurana awarded a Nobel Prize ?

Ans. In 1968, He was awarded the Nobel Prize in Physiology or Medicine for his excellent work on the interpretation of the genetic code and its function in protein synthesis. Khurana and his team had established that the mother of all codes, the biological language common to all organisms, is spelled out in three-letter words: each set of three nucleotide codes for a specific amino acid. Their Nobel lecture was delivered on December 12, 1968. Khurana was the first scientist to chemically synthesize oligonucleotides.

Exercise

1. Dr. Har Gobind Khurana used DNA and its analysis after receipt of Nobel Prize. Describe how ?
2. Name the various awards won by Dr. Har Gobind Khurana.
3. What is the mission of "Khurana Programme" ?

4.6.4 Dr. Satish Dhawan

Satish Dhawan born on 25, September 1920 was an Indian aerospace engineer, widely regarded as the father of experimental fluid dynamics research in India. Born in Srinagar, the University of Punjab in Lahore (Pakistan), where he completed a Bachelor of Arts in mathematics and Bachelor of Science in physics, followed by a Master of Arts in mathematics from the same institution. In 1943, he moved to the United States to further his education. He attended the University of Minnesota, Minneapolis and completed a Bachelor of mechanical engineering. In 1947, he completed a Master of Science in aerospace engineering and an Aeronautical Engineer's Degree from the California Institute of Technology, followed by a double PhD in mathematics and aerospace engineering in 1951. Dr. Dhawan joined as faculty at the Indian Institute of Science (IISc), Bangalore in 1951 and became its Director in 1962. Dhawan was one of the most eminent researchers in the field of turbulence and boundary layers, leading the successful and ingenious development of the Indian space programme. He succeeded Vikram Sarabhai, the founder of the Indian space programme and was Chairman of the Indian Space Research Organisation (ISRO) from 1972 to 1982. He also worked as secretary to the Govt. of India in the Department of Space.

Although he was the head of the Indian space programme, he devoted substantial efforts towards boundary layer research. His most important contributions are presented in the seminal book "Boundary Layer Theory" by Hermann Schlichting. He set up the country's first supersonic wind tunnel at IISc. He also pioneered research on relaminarization of separated boundary layer flows, three-dimensional boundary layers and trisonic flows.

Dhawan carried out pioneering experiments in rural education, remote sensing and satellite communications. His efforts led to operational systems like INSAT, a telecommunications satellite, IRS, the Indian Remote Sensing satellite, and the Polar Satellite Launch Vehicle (PSLV), that placed India in the league of space faring nations.

During his tenure at the Indian Institute of Science, Bangalore, he worked as Senior Scientific Officer in 1951, as Professor and Head of the Department of Aeronautical Engineering, 1955 and as its Director, 1962-1981. While at California Institute of Technology, US he was visiting Professor in 1971-72. At National Aerospace Laboratories, Bangalore he was Chairman, Research council, 1984-93. At the Indian Academy of Science he was President, 1977-1979 and at the Indian Space Research Organisation he was Chairman, 1972-1995. He worked at Indian Space Commission as chairman, 1972-2002.

Following his death in 2002, the satellite launch centre at Sriharikota, Andhra Pradesh, located about 100 km north of Chennai in South India, was renamed in his honour as the Satish Dhawan Space Centre. Satish Chandra Dhawan Govt. College, Ludhiana is named after him.

He was awarded :

- (i) Distinguished Alumnus Award, by California Institute of Technology in 1969.
- (ii) Padma Vibhushan (India's Second highest civilian honour), in 1981.
- (iii) Indira Gandhi Award for National Integration, in 1999.
- (iv) Distinguished Alumnus Award by Indian Institute of Science.

SUMMARY

◆ Satish Dhawan an Indian aerospace engineer, widely regarded as the father of experimental fluid dynamics research in India was born in Srinagar on 25 September 1920. In 1947, he completed a Master of Science in aerospace engineering and an Aeronautical Engineer's Degree from the California Institute of Technology, followed by a double PhD in mathematics and aerospace engineering in 1951. Dhawan was one of the most eminent researchers in the field of turbulence and boundary layers, leading the successful and ingenious development of the Indian space programme. He was Chairman of the Indian Space Research Organisation (ISRO) from 1972 to 1982. Dhawan carried out pioneering experiments in rural education, remote sensing and satellite communications. His efforts led to operational systems like INSAT, a telecommunications satellite, IRS, the Indian Remote Sensing satellite, and the Polar Satellite Launch Vehicle (PSLV), that placed India in the league of space faring nations.

◆ Before his death in 2002 he received many awards including Padma Vibhushan.

Short Question Answers**1. Who was Dr. Satish Dhawan?**

Ans. Satish Dhawan born on 25 September 1920 was an Indian aerospace engineer, widely regarded as the father of experimental fluid dynamics research in India, widely regarded as the father of experimental fluid dynamics research in India,

2. State in brief the research work carried out by Dr. Satish Dhawan.

Ans. Dhawan carried out pioneering experiments in rural education, remote sensing and satellite communications. His efforts led to operational systems like INSAT, a telecommunications satellite, IRS, the Indian Remote Sensing satellite, and the Polar Satellite Launch Vehicle (PSLV).

Exercise

1. Describe the qualifications acquired by Satish Dhawan.
2. Write the awards won by Dr. Satish Dhawan in his life.
3. Describe the carrier followed by Satish Dhawan in India.

4.6.5 Dr. Homi J Bhabha

Homi J. Bhabha was an eminent scientist who played a key role in the development of the Indian atomic energy program. He is also considered as the father of India's nuclear program. Before India's independence, Dr Bhabha and Nobel Laureate Sir C V Raman established the Cosmic Ray Research unit at the Indian Institute of Science in Bangalore in 1939. In 1945, he established the Tata Institute of Fundamental Research at Mumbai with the help of J R D Tata. Bhabha received the blessing of Pandit Nehru for effort towards peaceful development of atomic energy in India. He was selected a Fellow of the Royal Society on March 20 1941. He also established the Atomic Energy Commission of India in 1948. He represented India in International Atomic Energy Forums, and in Geneva in 1955 as President of the United Nations Conference on the Peaceful Uses of Atomic Energy. He died in a plane crash near Mont Blanc on January 24, 1966. After the death of Bhabha, the Atomic establishment was renamed as the Bhabha Atomic Research Centre.

His contribution to India's development goes far beyond the sphere of atomic energy. He had established two great research institutions namely the Tata Institute of Fundamental Research (TIFR), and the Atomic Energy Establishment at Trombay (which after Bhabha's death was renamed as the Bhabha Atomic Research Centre (BARC). He played a crucial role in the development of electronics in India. Bhabha was an outstanding scientist and a brilliant

engineer. He derived a correct expression for the probability of scattering positrons by electrons, a process now known as Bhabha scattering. Whatever he set himself to do, he did as a professional, but one who worked with love. He was relentlessly creative, enhancing life because he loved all forms of it. So he became a living proof that scientific excellence can go with excellence in arts and, racial differences need be no bar to friendship.

Homi Jehangir Bhabha was born on 30 October 1909 in a wealthy Parsi family of Mumbai. Bhabha's family had a long tradition of learning and service in the field of education. Bhabha's father was educated at Oxford and later qualified as a lawyer. His mother was grand-daughter of Sir Dinshaw Maneckji Petit, widely respected in Bombay for his philanthropic endowments.

Bhabha attended the Cathedral and John Connon Schools in Bombay. After passing Senior Cambridge Examination at the age of 15, Bhabha entered the Elphinstone College in Bombay and later the Royal Institute of Science, also in Bombay. In 1927 Bhabha joined the Gonville and Caius College in Cambridge. He took the Mechanical Sciences Tripos in 1930. At Cambridge Bhabha's interests gradually shifted to theoretical physics. In 1928 Bhabha in a letter to his father wrote : "I seriously say to you that business or job as an engineer is not the thing for me. It is totally foreign to my nature and radically opposed to my temperament and opinions. Physics is my line. Bhabha joined the Cavendish Laboratory, from where he obtained his Ph.D. in theoretical physics". He also held Salomons Studentship in Engineering during 1931-1932. His first research paper published in 1933 won him the Isaac Newton Studentship.

At Cambridge Bhabha's work centered around cosmic rays. The radiations reaching the top of the atmosphere from outer space are referred to as primary cosmic rays. Bhabha jointly with W. Heitler explained the cosmic-ray shower formation in a paper published in 1937. Before this the mechanism responsible for shower formation was the subject of much speculation. The important contributions made by Bhabha while working at Cambridge have been explained by G. Venkataraman as relativistic exchange scattering (Bhabha Scattering).

In 1939 when the Second World War broke out, Bhabha was in India. He came for a short holiday. However, the war changed his plan. Most of the scientists in England had to take part in war activities and there was no scope for doing basic research. In 1940 Bhabha joined the Indian Institute of Science at Bangalore where a Readership in Theoretical Physics was specially created for him. At the Indian Institute of Science Bhabha guided research on cosmic rays. He organised a group of young researchers in experimental and theoretical aspects of cosmic ray research. After spending a few years in India Bhabha was no longer interested in going back to England. He became convinced that it was his duty to build up research groups in the frontier of scientific knowledge.

In the early 1940s when Bhabha was working at the Indian Institute of Science, there was no institute in the country which had the necessary facilities for original work in nuclear physics, cosmic rays, high energy physics, and other frontiers of knowledge in physics. This prompted him to send a proposal in March 1944 to the Sir Dorab J. Tata Trust for establishing 'a vigorous school of research in fundamental physics'. The trustees of Sir Dorab J. Tata Trust decided to accept Bhabha's proposal and financial responsibility for starting the Tata Institute

for fundamental Research (TIFR) in April 1944. Mumbai (then Bombay) was chosen as the location for the proposed Institute as the Government of Bombay showed interest in becoming a joint founder of the proposed institute. The Institute received financial support from the Government of India from its second year, through the Council of Scientific and Industrial Research (CSIR) and the Ministry of Natural Research and Scientific Research. Today the main financial support for the Institute comes from the Government of India through the Department of Atomic Energy. It should be emphasised here that no organisational chart for future development was prepared for TIFR. Bhabha picked up the right kind of people first and then gave them opportunities to grow.

On April 26, 1948 Bhabha sent a note entitled 'Organisation of Atomic Research in India' to the then Prime Minister of India, Jawaharlal Nehru. In this note Bhabha wrote: 'The development of atomic energy should be entrusted to a very small and high powered body composed of say, three people with executive power, and answerable directly to the Prime Minister without any intervening link. For brevity, this body may be referred as the Atomic Energy Commission', independent of the secretariat of any other ministry or department of the government, including the envisaged Department of Scientific and Industrial Research. The Atomic Energy Commission was formed in August 1948. The first three things that Bhabha felt necessary for putting India's nuclear programme on a sound footing were:

- (i) The survey of natural resources, particularly materials of interest to atomic energy programme such as uranium, thorium, beryllium, graphite etc. To achieve this, a special unit named Rare Minerals Division was created with the help of Darashaw Noshervan Wadia (1883-1969).
- (ii) Development of strong research schools in basic sciences particularly physics, chemistry and biology by providing facilities to and training of high quality research scientists.
- (iii) Development of a programme for instrumentation particularly in electronics. A unit called Electronics Production Unit was started in TIFR, which later formed the nucleus of the large corporation known as Electronics Corporation of India Limited (ECIL) at Hyderabad.

When Bhabha realised that technology development for the atomic energy programme could no longer be carried out within TIFR he decided to build a new laboratory entirely devoted to this purpose.

Bhabha was elected a Fellow of the Royal Society in 1941. In 1943 he was awarded the Adams Prize by the Cambridge University for his work on cosmic rays, and in 1948 the Hopkins prize of the Cambridge Philosophical Society. In 1963 he was elected Foreign Associate of the U.S. National Academy of Sciences, and Honorary Life Member of the New York Academy of Sciences. In 1964 he was made Foreign Corresponding Academician of the Royal Academy of Sciences, Madrid. From 1960 until 1963 he was President of the International Union of Pure and Applied Physics. He was president of the historic International Conference of the Peaceful uses of atomic energy held, under U.N. auspices, at Geneva in August, 1955. Bhabha was President of the National Institute of Sciences of India in 1963 and President of the Indian Science Congress Association in 1951. He was awarded the title of Padma Bhushan by the Government of India in 1954.

Bhabha was killed in an air-crash near the famous Mont Blanc peak of the Alps on January 24, 1966, while he was on his way to Vienna to attend a meeting of the Scientific Advisory Committee of the International Atomic Energy Agency. At the time of his death, Bhabha was Director and Professor of Theoretical Physics of the Tata Institute of Fundamental Research, Secretary to the Government of India in the Department of Atomic Energy, ex-officio Chairman of the Indian Atomic Energy Commission, and Director of the Atomic Energy Establishment at Trombay. J R D Tata paid homage on the death of Bhabha in the words: "A Scientist, engineer, master-builder and administrator, steeped in humanities, art and music, Homi was truly a complete man".

SUMMARY

- ◆ Homi Jehangir Bhabha was an eminent scientist who played a key role in the development of the Indian atomic energy program. He is also considered as the father of India's nuclear program. Homi Jehangir Bhabha was born on 30 October 1909 in a wealthy Parsi family of Mumbai. Bhabha obtained his Ph.D. in theoretical physics after joining the Cavendish Laboratory, Cambridge. The trustees of Sir Dorab J. Tata Trust accepted Bhabha's proposal and financial responsibility for starting the Tata Institute for fundamental Research (TIFR) in April 1944. As per recommendations of Bhabha to the Govt. of India, Atomic Energy Commission was formed in August 1948 and thereafter Rare Minerals Division and Electronics Corporation of India Limited (ECIL) were started. He was president of the historic International Conference of the Peaceful uses of atomic energy held, under U.N. auspices, at Geneva in August, 1955. Bhabha was President of the National Institute of Sciences of India in 1963 and President of the Indian Science Congress Association in 1951. He was awarded the title of Padma Bhushan by the Government of India in 1954. Bhabha was killed in an air-crash near the famous Mont Blanc peak of the Alps on January 24, 1966, while he was on his way to Vienna.

Short Question Answers

1. What is Bhabha scattering, describe ?

Ans. Bhabha's work centered around cosmic rays. The radiations reaching the top of the atmosphere from outer space are referred to as primary cosmic rays. Bhabha jointly with W. Heitler explained the cosmic-ray shower formation in a paper published in 1937. Before this the mechanism responsible for shower formation was the subject of much speculation. The important contributions made by Bhabha while working at Cambridge have been explained as relativistic exchange scattering (Bhabha Scattering).



2. Write and describe in brief the three things that were felt necessary by Bhabha for India's nuclear programme.
- Ans. The first three things that Bhabha felt necessary for putting India's nuclear programme on a sound footing were;
- (i) The survey of natural resources, particularly materials of interest to atomic energy programme such as uranium, thorium, beryllium, graphite etc.,
 - (ii) Development of strong research schools in basic sciences particularly physics, chemistry and biology, and
 - (iii) Development of a programme for instrumentation particularly in electronics.

3. Mention the various posts held by Dr. Bhabha in the Govt. of India at the time of his death.
- Ans. At the time of his death, Bhabha was Director and Professor of Theoretical Physics of the Tata Institute of Fundamental Research, Secretary to the Government of India in the Department of Atomic Energy, ex-officio Chairman of the Indian Atomic Energy Commission, and Director of the Atomic Energy Establishment at Trombay.

Exercise

1. How will you describe Dr. Homi J Bhabha as an eminent scientist of India ?
2. Describe the family back ground and education of Homi Bhabha.
3. How did Bhabha Establish research institutes in India ?
4. Write down the prize and fellowships won by Dr. Homi J Bhabha.

4.7 NEED FOR ETHICAL CODES

Ethics may be defined as a system of moral principles concerning appropriate conduct for an individual or group ; or as the study of moral standards and how they affect one's behaviour. Individuals constantly have to make the choice between undertaking a particular action and/or doing what is right. This depends on listening to one's conscience, and the values there relate to family, cultural and religious backgrounds. There are several models and forms: codes, standards, charters, principles, declarations, policies, and guidelines, among others. They are usually prepared by organizations (often non-governmental) when there is no law or no adequate national or international laws existing to guide people in making particular decisions. They articulate a set of values based on notions of achieving the highest possible good. In the corporate sector ethical codes are adopted by organizations to assist members in understanding the difference between 'right' and 'wrong' and in applying that understanding to their decisions. An ethical code generally implies documents at three levels: codes of business ethics, codes of conduct for employees, and codes of professional practice. Ethical codes are often adopted by management, not to promote a particular moral theory, but rather because they are seen as pragmatic necessities for running an organization in which moral concepts play an important part. They are distinct from moral codes that may apply to the culture, education, and religion of a whole society.

Everyone who works in a community program of any kind, or who deals with other people in a professional or semi-professional capacity is subject to a code of ethics. There are, however, a number of formal ethical codes usually set down by professional organizations, but sometimes by law that apply to people in particular professional or other positions. Here are some examples of people expected to adhere to a formal code of ethics :

- ❖ Medical professionals (i.e., doctors, nurses).
- ❖ Mental health professionals (i.e., psychiatrists, psychologists, psychotherapists)
- ❖ Social workers
- ❖ Clergy
- ❖ Public officials
- ❖ Educators
- ❖ Youth workers
- ❖ People who work in child protective services
- ❖ Lawyers
- ❖ Mediators
- ❖ Administrators of all types of community programs
- ❖ Non-professional line staff (home health aides, overnight staff at residential facilities and shelters)

Ethics is a code of thinking and behaviour to be adopted in practice. It is governed by a combination of personal, moral, legal, and a social standard of what is right. Although the definition of "right" varies with situations and cultures, its meaning in the context of a community intervention involves a number of following guiding principles.

- (i) **Don't attempt an intervention in areas in which you're not trained and/or competent.** This goes along with "do no harm," but it's not always possible. Just as there are times when no intervention may be preferable to doing something counterproductive, there may be times when any intervention is better than none at all. In those circumstances, you may have to learn as you go, getting all the help you can and hoping you don't do anything harmful. It's important to distinguish between doing what you can and getting in over your head to the point where what you're doing becomes truly unethical and harmful.
- (ii) **Do what is best for everyone under the circumstances.** You're not necessarily going to be able to help everyone all the time, but you can try to get as close as possible.
- (iii) **Respect participants' ability to play a role in determining what they need.** Don't assume that professional staff or program planners necessarily know what's best for a community or individual.
- (iv) **Respect people as ends, not means.** consider and treat everyone as a unique individual who matters, not as a number in a political or social or clinical calculation.
- (v) **Don't abuse your position or exploit a participant** to gain a personal advantage or to exercise power over another person. This refers to taking advantage of participants or others for political, social, sexual, or financial gain.
- (vi) **Actively strive to improve or correct, to the extent possible, the situations of participants in your program and the community.** In other words, it's incumbent on you to try to create the best and most effective program possible to meet the needs of participants, and to address underlying conditions or situations in a way that will benefit the community as a whole.
- (vii) **Respect everyone's human, civil, and legal rights.** This encompasses such issues as non-discrimination and cultural sensitivity.
- (viii) **Do no harm to anybody.**

SUMMARY

- ◆ Ethics is a code of thinking and behaviour to be adopted in practice. Ethics may be defined as a system of moral principles concerning appropriate conduct for an individual or group. This depends on listening to one's conscience, and the values there relate to family, cultural and religious backgrounds. An ethical code generally implies documents at three levels : codes of business ethics, codes of conduct for employees, and codes of professional practice. There are a

number of formal ethical codes usually set down by professional organizations. People expected to adhere to a formal code of ethics are ; doctors, nurses, psychiatrists, psychologists, Clergy, Educators, Lawyers and Administrators etc. Although the definition of "right" varies with situations and cultures, its meaning in the context of a community intervention involves more than eight guiding principles.

Short Question Answers

1. Define Ethics.
Ans. Ethics may be defined as the study of moral standards and how they affect one's behaviour. It can also be called as a system of moral principles concerning appropriate conduct for an individual or group.
2. How are models of Ethics prepared ?
Ans. There are several models and forms: codes, standards, charters, principles, declarations, policies, and guidelines, among others. They are usually prepared by organizations (often non-governmental) when there is no law or no adequate national or international laws existing to guide people in making particular decisions.
3. Ethics is a code of thinking and behaviour, explain.
Ans. Ethics is a code of thinking and behaviour to be adopted in practice. It is governed by a combination of personal, moral, legal, and a social standard of what is right. Although the definition of "right" varies with situations and cultures.

Exercise

1. Name the professionals and other people who are expected to adhere to a formal code of ethics.
2. What is the difference between moral codes and ethical codes ?
3. Describe in brief the guiding principle for establishing Ethical Codes.



4.8 COMPUTER SOCIETY OF INDIA (C.S.I.)

Since the time of its formation in 1965, the CSI has been instrumental in guiding the Indian IT industry down the right path. Today, the CSI has 66 chapters all over India, 38 student branches, and more than 50,000 members, including India's most famous IT Industry leaders, brilliant scientists and dedicated academicians. The mission of the CSI is to facilitate research, knowledge sharing, learning and career enhancement for all categories of IT professionals, while simultaneously inspiring and nurturing new entrants into the industry and helping them to integrate into the IT community. The Society functions under the guidance of an Executive Committee. The members of this Committee are elected by voting members of the Society. Functional head of the Society is the President and is assisted by the Vice President, Secretary and Treasurer. The membership of the Society is open to all professionals involved in the field of information technology. The membership includes categories at the individual and institutional level. In the individual member category there are five grades namely Fellow, Senior, Member, Associate and Student, whereas institutional membership includes organizations and educational institutions.

The purpose of the society is scientific and educational, directed towards the advancement of the theory and practice of computer science, computer engineering and technology, systems science and engineering, information processing and related arts and sciences. Computer Society of India regularly organizes workshops, seminars, conventions, and technical talks for the benefit of professionals and users of IT. CSI also organizes a number of international conferences regularly. National Student Conventions have been the annual events since 1985. CSI along with its member institutions also hosts National, Regional, State level students symposia and conventions. It extends funding support for research projects as well as funds for visits of researchers presenting papers at international conferences. It facilitates industry-academia interaction through CIO meets and Professors' meets. There are awards for professionals, industry and government organizations to recognize achievements in ICT domain. It endeavours to :

- (i) Promote interchange of information, in these disciplines and sub-disciplines, amongst the specialists and between specialists and the public.
- (ii) Encourage and assist the professionals engaged in these fields to maintain the integrity and competence of the profession and foster a sense of partnership amongst the professionals, engaged in these fields.

Chapters of Student Branch

A Chapter of the Society is a group of members in a particular locality or city. Being closely associated with students, the Society has developed a well-established network of "Student Branches" all across the country. The activities conducted for the students associated with the Society include lecture meetings, seminars, conferences, training programmes, programming contests and practical visits to installations. CSI has a strong Educational Directorate which undertakes activities related to Certification of professionals related to the

latest technologies. It was set up in 1985, and a number of modules, such as Systems Analysis and Design, Data Communication, OS, and DBMS, are covered, in order to ensure a minimum level of professional competence, especially among those without a university background. Its recent initiative of distance education in the Business Domain areas offers technology enabled learning supported by personal counseling and expert advice. The Education Directorate organizes continuing educational and professional development programmes. It also extends finance assistance to research projects undertaken by faculty and postgraduate students. In an ever changing environment, CSI offers professional counseling being a great need of the hour. This is done by being in close contact with its young members through various events, conferences and symposia.

Special Interest Groups have been formed by Computer Society of India (CSI), to promote activities and research in few focused areas such as ;

- (a) Special Interest Group on Artificial Intelligence (SIGAI) as a national forum for promoting Artificial Intelligence (AI) with Central objectives which include,
 - ❖ To provide a national forum for interaction among Indian Artificial Intelligence community.
 - ❖ To act as an interface to other national AI forums and international bodies and initiatives.
 - ❖ To promote research and practical applications of AI in academia and industry.
- (b) Special Interest Group on eGovernance to focus on important areas where Information Technology can be leveraged.
- (c) Special Interest Group (SIG) on Free and Open Source Software (CSI-SIG-FOSS), for carrying out activities across the country in promoting the use of FOSS.

Computer Society of India brings out three national publications namely

- (i) CSI Journal of Computing,
- (ii) CSI Communications, and
- (iii) CSI Adhyayan.

Code of Ethics for IT Professionals

(Approved by CSI Executive Committee in its Meeting on 8th May, 1993)

The need for a Code of Ethics for the CSI has been felt for a long time. This has been formulated as given below :

A Professional member of the Computer Society of India (CSI) shall

- ❖ Organise the resources available to him and optimise these in attaining the objectives of his organization.
- ❖ Use the codes of practice conveyed by the CSI from time to time in carrying out his tasks.

- ❖ Not misuse his authority or office for personal gains.
- ❖ Comply with the Indian laws relating to the management of his organisation particularly with regard to Privacy and Piracy, and operate within the spirit of these laws.
- ❖ Conduct his affairs so as to uphold project and further the image and reputation of the CSI.
- ❖ Maintain integrity in research and publications.

Codes of Practice

- (i) As regards to his organisation an IT professional should :
- ❖ Act with integrity in carrying out the lawful policy and instructions of his organisation and uphold its image and reputation.
 - ❖ Plan, establish and review objectives and tasks for himself and his subordinates which are compatible with the Codes of Practice of other professionals in the enterprise, and direct all available effort towards the success of the enterprise rather than of himself.
 - ❖ Fully respect the confidentiality of information which comes to him in the course of his duties, and not use confidential information for personal gain or in a manner which may be detrimental to his organisation or clients.
 - ❖ Not snoop around in other people's computer files.
 - ❖ In his contacts and dealings with other people, demonstrate his personal integrity and humanity and when called to give an opinion in his professional capacity, shall, to the best of his ability, give an opinion that is objective and reliable.

(ii) As regards the Employees, an IT professional should

- ❖ Set and example to his subordinates through his own work and performance, through his leadership and by taking account of the needs and problems of his subordinates.
- ❖ Develop people under him to become qualified for higher duties.
- ❖ Pay proper regard to the safety and well-being of the personal for whom he is responsible.
- ❖ Share his experience with fellow professionals.

(iii) As regards the CLIENTS, an IT professional should :

- ❖ Ensure that the terms of all contracts and terms of business be stated clearly, unambiguously and honoured.
- ❖ In no circumstances supply inherently unsafe goods or services.
- ❖ Not use the computer to harm other people or to bear false witness.
- ❖ Be objective and impartial when giving independent advice.

- (iv) As regards the COMMUNITY, an IT professional should :
- ❖ Make the most effective use of all natural resources employed.
 - ❖ Be ready to give professional assistance in community affairs.
 - ❖ Not appropriate other people's intellectual output.
 - ❖ Always use a computer in ways that ensures consideration and respect for fellow humans.

Code of Ethics Undertaking

I affirm that as a professional member, I shall abide by the Code of Ethics of the Computer Society of India (CSI). I further undertake that I shall uphold the fair name of the Computer Society of India by maintaining high standards of integrity and professionalism. I am aware that any breach of the Code of Ethics may lead to disciplinary action against me under the Byelaws and rules of the CSI. I hereby confirm that I shall be bound by any decision taken by the CSI in such matters.

Place :

Signature :

Date :

Name :

Procedure for action against a member for any breach of the code of conduct of ethics

This procedure aims at setting out a strategy for dealing with the breaches of the Code of Ethics by the members of the CSI. The term members, includes Institutional members individually as well as collectively.

Complaints :

(i) All complaints shall be made in writing within 60 days of the violation of the Code of Ethics being noticed. These may be addressed to any Office Bearer of a Chapter or a member of the Executive Committee.

The complaint should include the following information :

- Date of breach/violation: person/persons involved.
- Place of event and circumstances.
- Witnesses.

(ii) All complaints will be sent to the President CSI, by the recipient, with his/her comments.

Sequence of Action :

- (i) The President will send the complaint to the Honours Committee of the CSI consisting of one Past President as Convenor and two Past Presidents/ Other Bearers as members.
- (ii) The Honours Committee will be appointed by the Executive Committee every year in its first meeting in July.
- (iii) The Honours Committee would meet and take the following actions :
 - (a) If the case is clear-cut, get written explanation/comments from various parties and set a date for hearing.
 - (b) Carry out investigation, by visit to the location, if necessary.
 - (c) Fix a date for a formal hearing. The hearing would go into evidences offered and allow witnesses to be brought and examined.
- (iv) The findings of the Honours Committee would depend on the merits of each case and their recommendation to the Executive Committee may be ;
 - (a) Honourable acquittal.
 - (b) Removal from membership.
- (v) The recommendations of the Honours Committee whenever any removal of a member from the membership of the CSI is involved, will be publicized through the CSI Publications after the approval of the Executive Committee.

SUMMARY

◆ Since 1965 the CSI has been instrumental in guiding the Indian IT industry. It has 66 chapters all over India, 381 student branches, and more than 50,000 members. The mission of the CSI is to facilitate research, knowledge sharing, learning and career enhancement for all categories of IT professionals. It extends funding support for research projects as well as funds for visits of researchers presenting papers at international conferences. It facilitates industry-academia interaction through CIO meets and Professors' meets. The Society has developed a well-established network of "Student Branches" all across the country. CSI has a strong Educational Directorate which undertakes activities related to Certification of professionals related to the latest technologies. Special Interest Groups have been formed by Computer Society of India (CSI), to promote activities and research in areas ; (a) Artificial Intelligence, (b) eGovernance, and (c) Free and Open Source Software. Code of ethics for IT professionals approved by CSI are ; (i) Organise the resources available, (ii) Use the codes of practice conveyed by the CSI, (iii) Not misuse his authority, (iv) Comply with the Indian laws, (v) uphold the image and reputation of the CSI, and (vi) Maintain integrity. In case of breach of code of ethics, CSI has formed procedure for action against such member.

Short Question Answers

1. Give an introduction of the Computer Society of India.

Ans. The CSI has been instrumental in guiding the Indian IT industry down the right path. Today, the CSI has 66 chapters all over India, 381 student branches, and more than 50,000 members, including India's most famous IT Industry leaders, brilliant scientists and dedicated academicians.

2. How does Computer Society of India help conduct research ?

Ans. The mission of the CSI is to facilitate research, knowledge sharing, learning and career enhancement for all categories of IT professionals, while simultaneously inspiring and nurturing new entrants into the industry and helping them to integrate into the IT community. It extends funding support for research projects as well as funds for visits of researchers presenting papers at international conferences. It facilitates industry-academia interaction through CIO meets and Professors' meets.

3. Describe the functioning of chapters of student branch in Computer Society of India.

Ans. The Society has developed a well-established network of "Student Branches" all across the country. The activities conducted for the students associated with the Society include lecture meetings, seminars, conferences, training programmes, programming contests and practical visits to installations.

Exercise

1. How does the Computer Society of India function ?

2. Describe the purpose of establishing Computer Society of India.

3. Write down the activities of Special Interests Group formed by Computer Society of India.

4. Describe the code of ethics for IT professionals approved by CSI.

4.8.1 Importance of an Oath to be taken by an Engineering Graduate

Engineers have a direct and vital impact on the quality of life of all the people in the society. As members of this profession, engineers are expected to exhibit the highest standards of honesty and integrity. Accordingly, the services provided by engineers require honesty, impartiality, fairness, and equity, and must be dedicated to the protection of the public health, safety, and welfare. Engineers must perform under a standard of professional behaviour that requires adherence to the highest principles of ethical conduct. Engineers, in the fulfillment of their professional duties, *should take an oath*, to follow :

4.8.1A Rules of Practice in the Profession of an Engineer

Engineers shall hold paramount the safety, health, and welfare of the public :

- (a) If engineers' judgment is overruled under circumstances that endanger life or property, they shall notify their employer or client and such other authority as may be appropriate.
- (b) Engineers shall approve only those engineering documents that are in conformity with applicable standards.
- (c) Engineers shall not reveal facts, data, or information without the prior consent of the client or employer except as authorized or required by law or this Code.
- (d) Engineers shall not permit the use of their name or associate in business ventures with any person or firm that they believe is engaged in fraudulent or dishonest enterprise.
- (e) Engineers shall not aid or abet the unlawful practice of engineering by a person or firm.
- (f) Engineers having knowledge of any alleged violation of this Code shall report thereon to appropriate professional bodies and, when relevant, also to public authorities, and cooperate with the proper authorities in furnishing such information or assistance as may be required.

Engineers shall perform services only in the areas of their competence :

- (a) Engineers shall undertake assignments only when qualified by education or experience in the specific technical fields involved.
- (b) Engineers shall not affix their signatures to any plans or documents dealing with subject matter in which they lack competence, nor to any plan or document not prepared under their direction and control.
- (c) Engineers may accept assignments and assume responsibility for coordination of an entire project and sign and seal the engineering documents for the entire project.

Engineers shall issue public statements only in an objective and truthful manner :

- (a) Engineers shall be objective and truthful in professional reports, statements, or testimony. They shall include all relevant and pertinent information in such reports, statements, or testimony, which should bear the date indicating when it was current.
- (b) Engineers may express publicly technical opinions that are founded upon knowledge of the facts and competence in the subject matter.
- (c) Engineers shall issue no statements, criticisms, or arguments on technical matters that are inspired or paid for by interested parties, unless they have prefaced their comments by explicitly identifying the interested parties on whose behalf they are speaking, and by revealing the existence of any interest the engineers may have in the matters.

- (d) Engineers shall act for each employer or client as faithful agents or trustees.
- (e) Engineers shall disclose all known or potential conflicts of interest that could influence or appear to influence their judgment or the quality of their services.
- (f) Engineers shall not accept compensation, financial or otherwise, from more than one party for services on the same project, or for services pertaining to the same project, unless the circumstances are fully disclosed and agreed to by all interested parties.
- (g) Engineers shall not solicit or accept financial or other valuable consideration, directly or indirectly, from outside agents in connection with the work for which they are responsible.
- (h) Engineers in public service as members, advisors, or employees of a governmental or quasi-governmental body or department shall not participate in decisions with respect to services solicited or provided by them or their organizations in private or public engineering practice.
- (i) Engineers shall not solicit or accept a contract from a governmental body on which a principal or officer of their organization serves as a member.

Engineers shall avoid deceptive acts :

- (a) Engineers shall not falsify their qualifications or permit misrepresentation of their or their associates' qualifications. They shall not misrepresent or exaggerate their responsibility in or for the subject matter of prior assignments. Brochures or other presentations incident to the solicitation of employment shall not misrepresent pertinent facts concerning employers, employees, associates, joint ventures, or past accomplishments.
- (b) Engineers shall not offer, give, solicit, or receive, either directly or indirectly, any contribution to influence the award of a contract by public authority, or which may be reasonably construed by the public as having the effect or intent of influencing the awarding of a contract. They shall not offer any gift or other valuable consideration in order to secure work. They shall not pay a commission, percentage, or brokerage fee in order to secure work, except to a bona fide employee or bona fide established commercial or marketing agencies retained by them.

4.8.1B Professional Obligations of an Engineer

Engineers shall be guided in all their relations by the highest standards of honesty and integrity.

- (a) Engineers shall acknowledge their errors and shall not distort or alter the facts.
- (b) Engineers shall advise their clients or employers when they believe a project will not be successful.



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- (c) Engineers shall not accept outside employment to the detriment of their regular work or interest. Before accepting any outside engineering employment, they will notify their employers.
 - (d) Engineers shall not attempt to attract an engineer from another employer by false or misleading pretenses.
 - (e) Engineers shall not promote their own interest at the expense of the dignity and integrity of the profession.
- Engineers shall at all times strive to serve the public interest :*
- (a) Engineers are encouraged to participate in civic affairs ; career guidance for youths ; and work for the advancement of the safety, health, and well-being of their community.
 - (b) Engineers shall not complete, sign, or seal plans and/or specifications that are not in conformity with applicable engineering standards. If the client or employer insists on such unprofessional conduct, they shall notify the proper authorities and withdraw from further service on the project.
 - (c) Engineers are encouraged to extend public knowledge and appreciation of engineering and its achievements.
 - (d) Engineers are encouraged to adhere to the principles of sustainable development in order to protect the environment for future generations.

Engineers shall avoid all conduct or practice that deceives the public :

- (a) Engineers shall avoid the use of statements containing a material misrepresentation of fact or omitting a material fact.
- (b) Consistent with the foregoing, engineers may advertise for recruitment of personnel.
- (c) Consistent with the foregoing, engineers may prepare articles for the lay or technical press, but such articles shall not imply credit to the author for work performed by others.

Engineers shall not disclose, without consent, confidential information concerning the business affairs or technical processes of any present or former client or employer, or public body on which they serve :

- (a) Engineers shall not, without the consent of all interested parties, promote or arrange for new employment or practice in connection with a specific project for which the engineer has gained particular and specialized knowledge.
- (b) Engineers shall not, without the consent of all interested parties, participate in or represent an adversary interest in connection with a specific project or proceeding in which the engineer has gained particular specialized knowledge on behalf of a former client or employer.

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Engineers shall not be influenced in their professional duties by conflicting interests :

- (a) Engineers shall not accept financial or other considerations, including free engineering designs, from material or equipment suppliers for specifying their product.
- (b) Engineers shall not accept commissions or allowances, directly or indirectly, from contractors or other parties dealing with clients or employers of the engineer in connection with work for which the engineer is responsible.

Engineers shall not attempt to obtain employment or advancement or professional engagements by untruthfully criticizing other engineers, or by other improper or questionable methods :

- (a) Engineers shall not request, propose, or accept a commission on a contingent basis under circumstances in which their judgment may be compromised.
- (b) Engineers in salaried positions shall accept part-time engineering work only to the extent consistent with policies of the employer and in accordance with ethical considerations.
- (c) Engineers shall not, without consent, use equipment, supplies, laboratory, or office facilities of an employer to carry on outside private practice.

Engineers shall not attempt to injure, maliciously or falsely, directly or indirectly, the professional reputation, prospects, practice, or employment of other engineers :

- (a) Engineers who believe others are guilty of unethical or illegal practice shall present such information to the proper authority for action.
- (b) Engineers in private practice shall not review the work of another engineer for the same client, except with the knowledge of such engineer, or unless the connection of such engineer with the work has been terminated.
- (c) Engineers in governmental, industrial, or educational employ are entitled to review and evaluate the work of other engineers when so required by their employment duties.
- (d) Engineers in sales or industrial employ are entitled to make engineering comparisons of represented products with products of other suppliers.

Engineers shall accept personal responsibility for their professional activities :

- (a) Engineers shall conform with state registration laws (if any) in the practice of engineering.
- (b) Engineers shall not use association with a non-engineer, a corporation, or partnership as a "cloak" for unethical acts.

Engineers shall give credit for engineering work to those to whom credit is due, and will recognize the proprietary interests of others :

- (a) Engineers shall, whenever possible, name the person or persons who may be individually responsible for designs, inventions, writings, or other accomplishments.
- (b) Engineers using designs supplied by a client recognize that the designs remain the property of the client and may not be duplicated by the engineer for others without express permission.
- (c) Engineers, before undertaking work for others in connection with which the engineer may make improvements, plans, designs, inventions, or other records that may justify copyrights or patents, should enter into a positive agreement regarding ownership.
- (d) Engineers' designs, data, records, and notes referring exclusively to an employer's work are the employer's property. The employer should indemnify the engineer for use of the information for any purpose other than the original purpose.
- (e) Engineers shall continue their professional development throughout their careers and should keep current in their specialty fields by engaging in professional practice, participating in continuing education courses, reading in the technical literature, and attending professional meetings and seminars.

4.8.1C Hypothetic Oath of an Engineer

I _____ as an engineer in my profession, promise to always ; maintain the prestige of the engineering profession ; limit the impact of my work on the environment ; know my limitation and ask for help when I need it ; make the best use of resources ; remember my responsibility to future generations ; respect confidential information and do my best to protect it ; report wrong doing or corruption ; use my skills and knowledge to improve the lives of society ; keep up with new developments in technology, and minimize and avoid health and safety risks to the public.

Place :

Signature :

Date :

Name :

SUMMARY

- ❖ The services provided by engineers require honesty, impartiality, fairness, and equity, and must be dedicated to the protection of the public health, safety, and welfare. Engineers, in the fulfillment of their professional duties are required to take an oath, to follow rules of practice in the profession of an Engineer by
 - (i) upholding paramount the safety, health, and welfare of the public,
 - (ii) performing services only in the areas of their competence,
 - (iii) issuing public statements only in an objective and truthful manner, and
 - (iv) avoiding deceptive acts.
- ❖ As an Engineer he/she has to fulfill the obligations of his profession i.e.,
 - (i) shall be guided in all their relations by the highest standards of honesty and integrity,
 - (ii) shall at all times strive to serve the public interest,
 - (iii) shall avoid all conduct or practice that deceives the public,
 - (iv) shall not disclose, without consent, confidential information concerning the business affairs or technical processes of any present or former client or employer, or public body on which they serve,
 - (v) Engineers shall not be influenced in their professional duties by conflicting interests,
 - (vi) shall not attempt to obtain employment or advancement or professional engagements by untruthfully criticizing other engineers, or by other improper or questionable methods,
 - (vii) shall not attempt to injure, maliciously or falsely, directly or indirectly, the professional reputation, prospects, practice, or employment of other engineers,
 - (viii) shall accept personal responsibility for their professional activities, and
 - (ix) shall give credit for engineering work to those to whom credit is due, and will recognize the proprietary interests of others.

Short Question Answers

1. *Enumerate the qualities that an engineer is supposed to possess.*
Ans. Engineers have a direct and vital impact on the quality of life of all the people in the society. As members of this profession, engineers are expected to exhibit the highest standards of honesty and integrity. Accordingly, the services provided by engineers require honesty, impartiality, fairness, and equity, and must be dedicated to the protection of the public health, safety, and welfare.
2. *What precautions should be taken by an engineer while making a public statement ?*
Ans. Engineers shall be objective and truthful in professional reports, statements, or testimony. They shall include all relevant and pertinent information in such reports.



statements, or testimony. Engineers may express publicly technical opinions that are founded upon knowledge of the facts and competence in the subject matter. They should issue no statements, criticisms, or arguments on technical matters that are inspired or paid for by interested parties.

3. Write down the hypothetic oath an Engineer.

Ans. I _____ as an engineer in my profession, promise to always; maintain the prestige of the engineering profession; limit the impact of my work on the environment; know my limitation and ask for help when I need it; make the best use of resources; remember my responsibility to future generations; respect confidential information and do my best to protect it; report wrong doing or corruption; use my skills and knowledge to improve the lives of society; keep up with new developments in technology, and minimize and avoid health and safety risks to the public.

Exercise

1. What are the responsibilities of an engineer towards the public?
2. How is an engineer guided by the standards of honesty and integrity?
3. How is confidentiality important for an engineer's profession?
4. How is an engineer supposed to behave with other fellow engineers?

4.9 ETHICAL CONDUCT AND ITS AUDIT IN BUSINESS

Ethics audits rely on honesty from all employees. It is the process whereby the auditor determines the degree to which one's ethics program meets the standards set forth in applicable law, regulation and policy, and the degree to which organizational and individual behaviour satisfies the requirements of that program. Conducting yourself ethically as a business owner and encouraging your employees to engage in ethical business conduct brings about several benefits for your company. Similarly, unethical conduct can hurt your business financially and tarnish its image, leading to diminished future opportunities for your company.

Ethics involve people from different walks of life, different countries and different cultures all agreeing on some basic principles of how to conduct themselves. Since business transactions in our increasingly global economy involve businesses with employees and owners who come from different backgrounds interacting with each other on a regular basis, business ethics provide a common ground everyone can agree upon. For example, accountants from different backgrounds may all prescribe to the same system of accounting standards such as *General Accepted Accounting Principles (GAAP)*. By everyone adhering to the same standards, investors and other groups can assess the financial performance of one company using the same methods it uses to evaluate another company.

If the employees feel that they are expected to act ethically and are treated ethically by their employer, they are less likely to engage in unethical behaviour that would hurt their employer. Employees are less likely to take company property, including office supplies, or make larger claims on expenses for travel or other business-related activities, including the cost of conducting some non-business activities. Employees who act ethically also do not take excessive breaks or spend company time and resources engaging in personal activities, lowering their productivity and the profitability of the business.

When your company, or the employees within your company, engage in behaviour that is either ethical or unethical, the members of the public who interact with your company take notice. If your company acts in ways the public considers ethical, your company enjoys an increase in public trust. Building a positive image in the public sphere helps your company unlock future opportunities and avoid intense public scrutiny during periods when your firm may struggle.

Each type of ethical audit is progressively more complex and offers the client a set of data which is more comprehensive. There is nothing wrong with any of them. Each serves a different purpose.

Cultural audits explore how employees and other stakeholders feel about the standards and behaviour of the organization. They assess perceived priorities and ethical effectiveness of individuals, groups, units or the organization as a whole.

In **systems audit**, the auditor assesses compliance and culture as part of a bigger whole; the degree to which the ethical principles, guidelines and processes of the organization are integrated within the organizational system.

The actual problem arises when clients' needs are not served because they have received the wrong audit for their desired outcomes. If, the clients' organization has an existing program to "prevent and detect ethics violations" and merely wishes to ensure that the program satisfies the specified guidelines for ethics violations, then a **compliance audit** is an appropriate response. For some clients a compliance audit may be all that they know to ask for. These clients may not appreciate what else might be accomplished through a culture or systems focused ethics audit.

If the client suspects intentional or unintentional wrongdoing and wants to understand its reason for occurring, then a cultural or systems audit may be a better choice. If the client wants to address the root causes of unethical behaviour then a systems audit may be the only effective alternative.

Depending on the country, state or even city where you are conducting business, engaging in some unethical activities may lead to trouble with the law. You may have to work to defend your business from legal action as a result, which takes away from any profit the business earns. Problems arising from unethical behaviour may seriously affect the company's ability to operate in certain markets.

4.9.1 Procedure to Conduct an Ethical Audit

Audits are designed to dig deep into company records to ensure reliability and accuracy in areas like accounting systems, financial reporting and legal compliance. Audits generally deal with quantitative, easily measurable data. Ethical issues, on the other hand, are more often qualitative or subjective in nature. A number of qualitative research techniques make an ethical audit possible, but an ethical audit still necessarily functions differently from any kind of financial audit. Considering the below mentioned multiple perspectives, to gain a picture of a company's commitment to ethics is the key to an ethical audit.

(i) Review the company's formal codes of ethics, ethics training programs and compliance policies for legal and industry guidelines regarding ethics. A commitment to ethics begins with formal policies in the employee handbook. Although having such policies in place does not guarantee real-world compliance, it is a vital first step in building a culture of strong ethics, and it can show how serious management is about ethical issues. Make sure ethics policies cover the full range of common issues in business, including discrimination, equal employment opportunity, financial management, sourcing, customer relations and the impact of company operations on the environment, the community and the world.

(ii) Look into past breaches of ethics through company records and archived sources. Begin by asking the business owner or an executive to discuss any legal issues the company has experienced, but do not let known that you intend to investigate. If you find something the company representative tried to hide, it can be a large red flag pointing to a culture of

dishonesty. When searching past news releases, look for any negative press about the company, and scrutinize the story for breaches of ethics. If any previous ethical lapses have occurred, speak with the company owner or an executive about what the company has done to prevent similar incidents from occurring since then and in the future.

(iii) Speak with employees regarding their impressions of the company's commitment to ethics. Take this opportunity to ask them to share their experiences about co-workers, managers and executives. Make sure all employees know their interviews are confidential and that honest answers will help to improve their organizations. Insiders know a large amount of information that the public, the press and government regulators are not aware of. Every breach of ethics is not illegal. Employees can be an insightful source of information on legal breaches of ethics, occurring on a regular basis. To make this information more quantitative, look for patterns in the responses you receive and record the number of times specific issues come up.

SUMMARY

- ❖ It is the process whereby the auditor determines the degree to which one's ethics program meets the standards set forth in applicable law, regulation and policy, and the degree to which organizational and individual behaviour satisfies the requirements of that program. Ethics involve people from different walks of life, different countries and different cultures all agreeing on some basic principles of how to conduct themselves. If the employees feel that they are expected to act ethically and are treated ethically by their employer, they are less likely to engage in unethical behaviour that would hurt their employer. Cultural audits explore how employees and other stakeholders feel about the standards and behaviour of the organization. In systems audit, the auditor assesses compliance and culture i.e., the degree to which the ethical principles, guidelines and processes of the organization are integrated within the organizational system. If the clients' organization has an existing program to "prevent and detect ethics violations" and merely wishes to ensure that the program satisfies the specified guidelines for ethics violations, then a compliance audit is an appropriate response.

Short question answers

1. Define ethical audit.

Ans. It is the process whereby the auditor determines the degree to which one's ethics programme meets the standards set forth in applicable law, regulation and policy, and the degree to which organizational and individual behaviour satisfies the requirements of that programme.

2. Describe importance of ethical audit in business.

Ans. Ethics involve people from different walks of life, different countries and different cultures all agreeing on some basic principles of how to conduct themselves. Since business transactions in our increasingly global economy involve businesses with employees and owners who come from different backgrounds interacting with each other on a regular basis, business ethics provide a common ground everyone can agree upon.

3. How is ethical conduct of Employees important in any company/ business ?

Ans. If the employees feel that they are expected to act ethically and are treated ethically by their employer, they are less likely to engage in unethical behaviour that would hurt their employer. Employees are less likely to take company property, including office supplies, or make larger claims on expenses for travel or other business-related activities, including the cost of conducting some non-business activities. Employees who act ethically also do not take excessive breaks or spend company time and resources engaging in personal activities, lowering their productivity and the profitability of the business.

4. Describe the types of ethical audits.

Ans. There are three types of ethical audits i.e., (i) *Cultural audits* explore how employees and other stakeholders feel about the standards and behaviour of the organization, (ii) In *systems audit*, the auditor assesses compliance and culture as part of the whole system i.e., the degree to which the ethical principles, guidelines and processes of the organization are integrated within the organizational system and (iii) *Compliance audit* is an appropriate response, if the clients' organization has an existing program to "prevent and detect ethics violations" and merely wishes to ensure that the program satisfies the specified guidelines for ethics violations.

5. How is ethical audit designed and processed with ?

Ans. Audits are designed to dig deep into company records to ensure reliability and accuracy in areas like accounting systems, financial reporting and legal compliance. Audits generally deal with quantitative, easily measurable data. Ethical issues, on the other hand, are more often qualitative or subjective in nature. A number of qualitative research techniques make an ethical audit possible, but an ethical audit still necessarily functions differently from any kind of financial audit.

Exercise

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1. How is ethical audit important and involved in different walks of life ?
 2. How is ethical conduct of employees important for a company/business ?
 3. Describe in details any two types of ethics audit.
 4. Name the areas covered in ethics audit.
 5. How and why speaking to employees is important during ethics audit ?