

UNIT V**GLOBAL ISSUES****5.1. GLOBALIZATION**

Globalization means integration of countries through business, transfer of technology, and exchange of information and culture. The growth and development of multinational corporations is the significant result of globalization. In a way, it includes acting together and interacting economies through trade, investment, loan, development schemes and capital across countries. It includes transfer of knowledge, science, technology, skills, culture, information and entertainment, besides human resource, tele-work and outsourcing. Globalization creates a world market for anyone to exploit.

5.2. MULTINATIONAL CORPORATIONS

Multinational corporations are known as MNCs. Organizations who have established business in more than one country, are called multinational corporation. The headquarters are in the home country and the business is extended in many host countries. MNCs have business interest across the globe and do business in many countries, either on their own or in partnership with a local business entity. The western organizations doing business in the less-economically developed countries gain the advantage of inexpensive labour, availability of resources, conductive-tax atmosphere, and virgin market for the products. At the same time, the developing countries are also benefited by fresh job opportunities, jobs with higher remuneration and challenges, transfer of technology, and several social benefits by the wealth developed. But this happens invariable with some social and cultural disturbance. Loss of jobs for the home country, and loss or exploitation of natural resources, political instability for the host countries are some of the threats of globalization.

5.2.1. International Human Rights

To know what are the moral responsibilities and obligations of the multinational corporations operating in the host countries, let us discuss with the framework of right ethics. Common minimal rights are to be followed to smoothen the transactions when the engineers and employers of MNCs have to interact at official, social, economic and sometimes political levels. At international level, the organizations are expected to adopt the minimum levels of

(a) Values, such as mutual support, loyalty and reciprocity.

(b) The negative duty of refraining from harmful actions such as violence and fraud.

(c) Basic fairness and practical justice in case of conflicts.

The ten international rights are

1. Right of freedom of physical movement of people.
2. Right of ownership of properties.
3. Freedom from torture.
4. Right to fair trial on the products
5. Freedom from discrimination on the basis of race or sex. If such discrimination against women or minorities is prevalent in the host country, the MNC will be compelled to accept. MNCs may opt to quit that country if the human rights violations are severe.
6. Physical security. Use of safety gadgets have to be supplied to the workers even if the laws of the host country do not suggest such measures.
7. Freedom of speech and forming association.
8. Right to have a minimum education.
9. Right to political participation.
10. Right to live and exist. The individual liberty and sanctity of the human life are to be respected by all societies.

5.2.2. Technology Transfer

Technology transfer is the process of moving technology to a novel setting and implementing it there. Technology includes both hardware (machines and installations) and technique (technical, organizational, managerial skills and procedures). It may mean moving the technology applications from laboratory to the field/factory or from one country to another. A variety of agents may conduct the transfer of technology: governments, universities, private volunteer organizations, consulting firms and multinational corporations.

5.2.3. Appropriate Technology

The expression appropriate technology is widely used, but with a variety of meanings. Identification, transfer and implementation of most suitable technology for a set of new situations, is called appropriate technology. Technology includes both hardware (machines and installations) and software (technical, organizational and managerial

skills and procedures). Factors such as economic, social and engineering constraints are the causes for the modification of technology.

Depending on the availability of resources, physical conditions (such as temperature, humidity, salinity, geographical location, isolated land area, and availability of water), capital opportunity costs, and the human value system (social acceptability) which includes their traditions, beliefs, and religion, the appropriateness is to be determined.

For example, small farmers in our country prefer to own and use the power tillers, rather than the high-powered tractors or sophisticated harvesting machines. On the other hand, the latest technological device, the mobile phones and wireless loop phones have found their way into remote villages and hamlets, than the landline telephone connections. Large aqua-culture farms should not make the existing fishermen jobless in their own village.

The term appropriate is value based and it should ensure fulfillment of the human needs and protection of the environment.

Appropriate technology also implies that the technology should contribute to and not distract from sustainable development of the host country by not degrading the environment beyond its carrying capacity and by providing for careful stewardship of its natural resources.

Appropriate technology overlaps with, but is not reducible to, intermediate technology, which lies between the most advanced forms in industrialized countries and comparatively primitive forms in less- developed countries. The British economist E.F. Schumacher argued that intermediate technologies are preferable but the most advanced technologies usually have harmful side effects, such as causing mass migrations from rural areas to cities where corporations tend to locate. These migrations cause overcrowding, and with it poverty, crime and disease. For more appropriate, he argued are smaller-scale technologies replicated throughout a less-developed country, using low capital investment, labour intensiveness to provide needed jobs, local resources where possible, and simpler techniques manageable by the local population given its education facilities

Appropriate technology is a generic concept that applies to all attempts to emphasize wider social factors when transferring technologies. As such, it reinforces and amplifies our view of engineering as social experimentation.

5.2.4. MNCs and Morality

The economic and environmental conditions of the home and host countries may vary. But the MNCs have to adopt appropriate measures not to disturb or dislocate the social and living conditions and cultures of the home countries. A few principles are enlisted here:

1. MNC should respect the basic human rights of the people of the host countries.
2. The activities of the MNC should give economic and transfer technological benefits, and implement welfare measures of the workers of the host countries.
3. The business practices of the multinational organizations should improve and promote morally justified institutions in the host countries.
4. The multinationals must respect the laws and political setup, besides cultures and promote the cultures of the host countries.
5. The multinational corporations should provide a fair remuneration to the employees of the host countries. If the remuneration is high as that of home country, this may create tensions and if it is too low it will lead to exploitation.
6. Multinational corporations should provide necessary safety for the workers when they are engaged in hazardous activities and 'informed consent' should be obtained from them. Additional compensation should be paid to them for the additional risks undertaken.

5.2.5. Case Study: Bhopal Gas Tragedy

The Bhopal gas tragedy is considered the worst industrial disaster in the Indian industry. The leak of the methyl isocyanate gas from the Union Carbide India Limited (UCIL) plant at Bhopal caused immense damage. It led to the loss of several lives and long-term health effects to thousands of people. Thousands of children died and many others were disabled after the accident. This led to a death of more than 6000 people and around the plant and injured more than 7000 people; approximately 2,00,000 people had adverse health effects.

The tragedy happened on the midnight of 3 December 1984. UCIL was established in 1969 to produce a pesticide called Sevin using methyl isocyanate as an intermediate. The methyl isocyanate production plant came into existence in the plant premises in 1979. During the night of 3-4 December 1984, water entered the tank containing 42 tonnes of methyl isocyanate. This led to an exothermic reaction causing the temperature rise to about 200°C and also increased the pressure. This high pressure caused the release of the toxic gas into the atmosphere. Many people died after inhaling the deadly gas. People usually complained of eye irritation, vomiting, throat

congestion and suffocation. More than 1.5 lakh people were treated at hospitals and temporary dispensaries.

The cumulative effects of the following factors caused the tragedy in Bhopal on December 3, 1984.

- Methyl isocyanate was an intermediate in the process employed and large quantities were stored as a part of the production process. This was potentially very dangerous as the plant was located in a densely populated area. The plant also had a densely populated slum around it.
- Methyl isocyanate was stored in large tanks and beyond recommended levels. This was compounded by failure of safety systems due to poor maintenance.
- The refrigeration system of the tank was switched off. If this had been kept functional, the temperature rise would have not been so severe.
- Maintenance was neglected and the trained maintenance personnel were reduced as economy measure.
- Training activities for the supervisory personnel were stopped. This led to inadequate training of the personnel to handle emergencies.
- Periodical safety inspection teams from US who visited previously were also stopped. From the initial US standards, the safety procedures were reduced to low level Indian standards. The Indian plant was equipped and operated on different standards from the one in US. There was complete laxity in the standards of the Indian company.
- The plant was shut down for maintenance two months earlier. The worker who cleaned the pipes and filter connected to the tanks and closed the valves, was not trained properly. He did not insert the safety disks to prevent any possible leakage of the gas. This led to the build up of temperature and pressure in the storage tanks.
- When the gas started leaking out, the operators tried to use the vent gas - scrubber that was designed to reduce the exhausting gas. But the scrubber was also shut down.
- There was a flare tower that was designed to burn-off the gas escaping from the scrubber. That was not also in working condition.
- The workers finally tried to spray water upto 100 feet to quench the gas. But the gas was escaping from the 120 feet high chimney.

- The workers were not trained on safety drills or emergency drills or any evacuation plans

5.2.6. Ethical Balance

Should an organization adopt the rules and practices of the host country fully and face dangers and other serious consequences or adopt strictly their own country's standards and practices in the host country?

There is a saying, "when in Rome do as Romans do". Can this be applied in the case of MNCs? This is called ethical relativism. The actions of corporation and individuals that are accepted by law, custom and other values of a society can be morally right in that society, It is morally false, if it is illogical. It means, the corporation (and the engineers) functioning in other countries must understand their law, customs and beliefs and act in line with those prevailing in that country. This will lead to disaster if the country is a developing one where the safety standards are given a go-bye. Laws and conventions are not morally self sustaining. In a over populated country, the loss of human lives may not physically affect them, but the tragedy cost shadow for over decades, as it happened in Bhopal in 1984. This will be criticized from the points of view of human rights, public welfare, and respect to people.

On the other hand, the organizations may practice laws of the home country, without adjustments to the host culture. This stand is called ethical absolutism. This is again false, since the moral principles in a different culture come into conflicts, and implementation in the 'hostile' culture is almost impossible.

Hence, MNCs may adopt ethical relationalism (contextualism) as a compromise. Moral judgments are made in relation to the factors prevailing locally, without framing rigid rules. The judgments should be contextual and in line with the customs of other cultures. The ethical pluralism which views more than one justifiable moral solution is also adaptable. This principle accepts cultural diversity and respects the legitimate cultural differences among individuals and groups, of the host country.

5.3. ENVIRONMENTAL ETHICS

Environmental ethics is the study of

- (a) moral issues concerning the environment, and
- (b) moral perspectives, beliefs, or attitudes concerning those issues.

Over the years, environmental ethics has developed into a discipline by itself after remaining a branch of philosophy for many years. This is indicative of the critical nature

of the discipline as well. The following are some major issues that concern environmental ethics today:

- ✓ Plastic waste disposal
- ✓ e-waste disposal
- ✓ Climate changes
- ✓ Green house effect
- ✓ Global warming
- ✓ Acid rain
- ✓ Ozone depletion
- ✓ Pollution
- ✓ Over population and destruction of forests or animal habitats
- ✓ Exponentially increasing depletion of natural resources
- ✓ Genetic engineering, cloning, genetically modified foods
- ✓ Intensive farming and overuse of pesticides

Plastic waste disposal

In our country, several crores of plastic bottles are used as containers for water and oil, and plastic bags are used to pack different materials ranging from vegetables to gold ornaments. Hardly any of these are recycled. They end up in gutters, road sides and agricultural fields. In all these destinations, they have created havoc. The worse still is the burning of plastic materials in streets and camphor along with plastic cover in temples since they release toxic fumes and threaten seriously the air quality. Cities and local administration have to act on this, collect and rearrange for recycling through industries.

e-waste disposal

The parts of computers and electronic devices which have served its useful life present a major environmental issue for all the developing countries including India. This scrap contains highly toxic elements such as lead, cadmium and mercury.

Climate changes

Over the years, the climate in various places has undergone perceptible changes. In India, delayed monsoons, excessive rains and floods, drought conditions, etc., have

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become common. It is believed that these are due to many man-made causes. The factors that contribute to climate change are changes in solar radiation patterns, changes in earth's orbit and concentration of greenhouse gases.

Greenhouse effect

The greenhouse effect is due to the presence of greenhouse gases in the atmosphere. Gases producing greenhouse effect are water vapour, Carbon-dioxide, methane, ozone and chlorofluorocarbon. The sun's rays provide energy to the earth. The greenhouse gases have the effect of trapping infrared radiation, which is essentially heat radiation. The trapped heat is radiated both upwards and downwards. This results in the warming of the atmosphere.

Global Warming

Greenhouse effect increases the temperature of the earth's atmosphere. The presence of excessive $C*O_{2}$ in the atmosphere causes warming. This excessive $C*O_{2}$ is due to the excessive burning of gaseous fuels coupled with the decrease in forest cover, which could have absorbed the gas. Global studies have indicated that the average temperature has increased marginally over the years.

Acid rain

Large emissions of sulphur oxides and nitrous oxides are being released into the air from the thermal power stations using the fossil fuels, and several processing industries. These gases form compounds with water in the air and precipitates as rain or snow on to the earth. The acid rain in some parts of the world has caused sufficient damage to the fertility of the land and to the human beings.

Ozone depletion

Ozone is the layer of gas found in the stratosphere. The ozone layer protects the entire planet from the ill effects of ultraviolet radiation. UV rays are harmful to plants and humans. The depletion in ozone volume is thought to be due to the presence of Chloro-fluro- carbons (CFC) in the atmosphere, which break down the ozone. The CFCs are present in commonly used refrigerants. The increased UV radiation reaching the earth's atmosphere is believed to be the cause of increased skin cancer in humans. Further NO and $fN*O_{2}$ gases were also found to react with the ozone.

Pollution

Pollution is the contamination of the three elements - air, land and water of the biosphere. This leads to many diseases of the life forms in the biosphere.

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Air pollution

Air pollution is due to the increased presence of solid particles, harmful liquids and gases in the air. Air pollution is severe in urban centres where human activities are concentrated. Smoke and exhaust gases from industries and automobiles are the major cause for air pollution. Smog, a combination of dust particles and smoke in the air reduces visibility. At low levels, air pollution causes eye irritation and inflammation of the respiratory tract. Pollution also corrodes metals and affects buildings. At very high levels, air pollution can lead to acid rain, ozone depletion and global warming. Air pollution is becoming an increasing risk for human health.

Land pollution

Land pollution is due to intensive agricultural practices using chemical fertilizers and pesticides. These pesticides damage the land and destroy the ecosystem thriving there. Land pollution is also caused by excessive dumping of domestic and industrial waste in dumping grounds. As more and more waste is generated, more land is acquired for dumping. Mining and other activities also damage the land.

Land pollution causes severe damage to virgin land makes it a health hazard. Over the years, the fertility of the land decreases. Organic farming practices using conventional fertilizers will reduce land pollution. We need to look at using a reduced quantity of pesticides. Recycling of waste is a necessity. More efficient garbage disposal mechanisms are required if we want to save the land and remove health hazards.

Water pollution

Ground water is extensively used by communities for various purposes. Fluorosis is present in present in large quantities in deep borewell water. Water also gets contaminated by industrial waste being discharged without treatment, and leakage of sewage water into water bodies. Arsenic poisoning and metal contaminants have been found in many water bodies. Rivers and oceans are heavily polluted. Marine pollution is a result of industrial and agricultural pollutants. Sewage water is a major source of sea water pollution near the coasts. Oil spills from sea carriers is a major cause of concern as they destroy the ecosystem in the area.

5.4. COMPUTER ETHICS

Computers have rapidly become a ubiquitous tool in engineering and business. They are digital machines with the capacity to store an enormous amount of data, retrieve and process them at great speed, and display the results instantly. There are ways in which computers have benefits to society. Unfortunately, there are also numerous ways

in which computers have been misused, leading to serious ethical issues. The problems related to computer are use of unauthorized information stored on computer databases, unwanted communication, software piracy, computer hocking, manipulation of passwords to steal from bank accounts, introduction of computer viruses. Computer ethics is the branch of engineering ethics dealing with moral issues in computer technology. The common issues with computer is discussed below.

Hacking

Hacking into computer systems is a common crime. It needs some expertise, which many computer users have acquired. It may start as a fun game but often leads to criminal acts involving stealing somebody's email ID and sending mails on that ID to others. This comes into the realm of invading someone's privacy and creating a misunderstanding.

Hacking is the process of entering the computer systems of other people with the intention of either collecting information or crashing the system. Hacking is classified into two types-ethical hacking and illegal hacking. People who perform ethical hacking are known by the fancy name 'white hats' and those who do illegal hacking are known as 'black hats'.

Software piracy

Software piracy is the illegal copying of genuine copyright programmes for personal use or sale. Examples of piracy include end user copying, hard disk loading, counterfeiting, illegal downloads from the internet etc.

Virus dissemination

It is a crime to spread computer viruses, which are software programmes, by e-mails or hacking into other computer systems.

Online fraud

While the internet is a boon to organizations for doing business at great speed and at a lower cost, it is also an invitation for fraudsters to commit crimes. Using authentic looking websites that are used to commit fraud, business information and personal data are acquired to commit various types of crimes. Lottery frauds are also becoming common with many people unknowingly falling victim to such invitations.

Cyber stalking

It is defined as the repeated acts of harassment or threatening behaviour of the cyber criminal towards the victim by using internet services. Cyber stalking refers to the use

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of the internet, e-mail, or other electronic communications device to stalk another person. It is a relatively new form of harassment, unfortunately, rising to alarming levels especially in big cities.

The Ten commandments of Computer Ethics

1. Don't use a computer to harm other people.
2. Don't interfere with other people's computer work.
3. Don't snoop around into other people's computer files.
4. Don't use a computer to steal.
5. Don't use a computer to bear false witness.
6. Don't use or use proprietary software for which you have not paid.
7. Don't use other people's computer resources without proper authorization or proper compensation.
8. Don't appropriate other people's intellectual output.
9. Think about the social consequences of the program you are writing or the system you are designing.
10. Use computer in ways that ensure consideration and respect for your fellow humans.

5.5. WEAPONS DEVELOPMENT

One of the largest employers of engineers worldwide is the defense industry. There are many ethical issues concerned with weapon development in which many professional contribute significantly.

Weapons development involves both equipment and ammunition. Many recent developments in weaponry call for sophisticated delivery systems for bombs and missiles. A considerable amount of research is being carried out to develop more and more lethal weapons of mass destruction. The development of biological and chemical weapons is another matter of concern the world over.

Since weapons are designed basically for one purpose - to kill human beings - it is important to look at the type of engineering work in the context of engineering ethics and the rights of engineers. An engineer may choose either to work or not to work in defense-related industries and be ethically justified in either position. Many reasonable engineering professionals feel that, ethically, they cannot work on designs that will

ultimately be used to kill other humans. Their remoteness from the killing site does not change this feeling. Even though they will not push the button, trigger the gun or may never actually see the victims of the weapon, they still find it morally unacceptable to work on such systems.

On the other hand, equally morally responsible engineers find this type of work ethically acceptable. They reason that it is pride and honour in participating in the activities towards the defense of the nation. It gives one a job with high salary.

Given the issues that surround defense work, what is an engineer to do when asked to work on a weapons project he considers questionable? As with many of the ethical dilemmas, there is no simple solution, but rather the answers must be determined by each individual after examination of his values and personal feelings about the ethics of defense work. It is important to avoid working on any project that you deem unethical, even if it might lead to career advancement, or even if it is a temporary job. This principle also holds true for projects that you feel are unsafe, dangerous for the environment, etc. It can be argued that weapons work is the most important type of engineering, given its consequences for mankind. Because of the implications to human life, this type of engineering requires an even more stringent examination of ethical issues to ensure responsible participation.

5.6. ENGINEERS AS MANAGERS

Engineers are generally considered to be technocrats. Many engineers move into management, often after a few years of starting their career. After having been only an engineer, a person may be promoted as a manager in an organization. As a manager he would have a number of subordinates working under him and other colleagues working with him. There would also be his superiors. If one has to become a good boss, one needs to be a good subordinate first. This transition from technical to managerial work calls for a number of adjustments. Engineers are preferred as managers because of their strong analytical and problem solving skills and work ethics.

The skills required as an engineer are technical: but when one becomes a manager, managerial skills like motivation, communication, and teamwork are essential. Unless he acquires managerial skills he may not succeed as a manager.

As a manager, engineers remain professionals whose primary responsibility is to provide useful products and services while ensuring that they are safe and profitable. He has the responsibility for promoting ethical climate in the organization and resolving conflicts among the subordinates. As a manager he has to combine formal organization

and policies with informal traditions and practices and personal attitudes and commitments.

5.6.1. Characteristics

The characteristics of engineers are:

- ✓ Promote an ethical climate through framing organization policies, responsibilities and by person attitudes and obligations.
- ✓ Resolving conflicts, by evolving priority, developing mutual understanding, generating various alternative solutions to problems.
- ✓ Social responsibility to stake-holders, customers and employers. They act to develop wealth as well as the welfare of the society. Ethicists project the view that the manager's responsibility is only to increase the profit of the organization, and only the engineers have the responsibility to protect the safety, health and welfare of the public. But managers have the ethical responsibility to produce safe and good products, while showing respect for the human beings which include the employees, customers and the public. Hence, the objective for the managers and engineers is to produce valuable products that are also profitable.

5.6.2. Managing Conflicts

In solving conflicts, force should not be resorted. In fact, the conflict situations should be tolerated, understood, and resolved by participation by all the concerned. The manager's task is to create climates in which conflicts are addressed constructively. The conflicts may arise in the following ways.

- ✓ Conflicts based on schedules: This happens because of various levels of execution, priority and limitations of each level.
- ✓ Conflicts arising out of fixing the priority to different projects or departments. This is to be arrived from the end requirements and it may change from time to time.
- ✓ Conflict based on the availability of personnel.
- ✓ Conflict arising in administration such as authority, responsibility, accountability and logistics required.
- ✓ Conflicts of personality, human psychology and ego problems.
- ✓ Conflict over expenditure and its deviations.

Most of the conflicts can be resolved by following the principles listed here:

1. People

Separate people from the problem. It implies that the views of all concerned should be obtained. The questions such as what, why, and when the error was committed is more important than to know who committed it. This impersonal approach will lead to not only early solution but also others will be prevented from committing errors.

2. Interests

Focus on interests, not positions

Focus must be only on interest i.e., the ethical attitudes or motives and not on the positions. A supplier may require commission larger than usual prevailing rate for an agricultural product. But the past analysis may tell us that the material is not cultivated regularly and the monsoon poses some additional risk towards the supply. Mutual interests must be respected to a maximum level. What is right is more important than who is right.

3. Options

Generate various options as solution to the problem. This helps a manager to try the next best solution should the first one fail. Decision on alternate solutions can be taken more easily and without loss of time.

4. Evaluation

The evaluation of the results should be based on some specified objectives such as efficiency, quality and customer satisfaction. More important is that the means, not only the goals, should be ethical.

5.7. CONSULTING ENGINEERS

Consulting engineers work in private practice. They are compensated by fees for the services they render, not by salaries received from employers. Because of this, they tend to have greater freedom to make decisions about the projects they undertake. Yet their freedom is not absolute. They share with salaries engineers the need to earn a living.

5.7.1. Who is a Consultant?

A consultant is an independent and qualified person providing services in identifying and investigating into management problems concerned with an organization, procedures, methods, policy, etc., recommending appropriate actions and helping in the implementation of these recommendations.

5.7.2. Key Features of a Consultancy

- ✓ Consultancy is an independent service.
- ✓ It is an advisory role.
- ✓ It provides specialized knowledge and skills.
- ✓ It provides practical solutions for problems.

5.7.3. Requirements of Consultants

- ✓ Technical know-how.
- ✓ Professional experience.
- ✓ Creativity and analytical ability.
- ✓ Diplomacy and tact.
- ✓ Effective communication and ability to put across ideas effectively.

5.7.4. Responsibilities of Consulting Engineers

Consulting engineers have greater freedom than most salaried engineers. A consulting engineer will face disputes relating to advertising, competitive bidding, contingency fees and technical opinions in disputes.

1. Advertising

The consulting engineers are directly responsible for advertising their services, even if they employ other consultants to assist them. But in many organizations, this responsibility is with the advertising executives and the personnel department.

They are allowed to advertise but to avoid deceptive ones. Deceptive advertising such as the following are prohibited:

- (a) By white lies.
- (b) Half truth e.g. a product has actually been tested as prototype, but it was claimed to have been already introduced in the market. An architect shows the photograph of the completed building with flowering trees around but the foundation of the building has been completed and there is no real garden.
- (c) Exaggerated claims. The consultant might have played a small role in a well-known project. But they could claim to have played a major role.
- (d) Making false suggestions. The reduction in cost might have been achieved along with the reduction in strength, but the strength details are hidden.

(e) Through vague wordings or slogans.

2. Competitive Bidding

It means offering a price, and get something in return for the service offered. The organizations have a pool of engineers. The expertise can be shared and the bidding is made more realistic. But the individual consultants have to develop creative designs and build their reputation steadily and carefully, over a period of time. The clients will have to choose between the reputed organizations and proven qualifications of the company and the expertise of the consultants. Although competent, the younger consultants are thus slightly at a disadvantage

3. Contingency Fee

This is the fee or commission paid to the consultant, when one is successful in saving the expenses for the client. A sense of honesty and fairness is required in fixing this fee. The NSPE code III 6 (a) says that the engineers shall not propose or accept a commission on a contingent basis where their judgment may be compromised.

The fee may either as an agreed amount or a fixed percentage of the savings realized. But in the contingency fee-agreements, the judgment of the consultant may be biased. The consultant may be tempted to specify inferior materials or design methods to cut the construction cost. This fee may motivate the consultants to effect savings in the costs to the consultants to effect saving in the costs to the clients, through reasonably moral and technological means.

4. Safety and Client's Needs

The greater freedom for the consulting engineers in decision making on safety aspects, and difficulties concerning truthfulness are the matters to be given attention. For example, in design - only projects, the consulting engineers may design something and have no role in the construction. Sometimes, difficulties may crop up during construction due to non-availability of suitable materials, some shortcuts in construction, and lack of adequate supervision and inspection. Properly- trained supervision is needed, but may not happen, unless it is provided. Further, the contractor may not understand and/or be willing to modify the original design to serve the clients best. A few on site inspections by the consulting engineers will expose the deficiency in execution and save the workers, the public, and the environment that may be exposed to risk upon completion of the project.

5.8. ENGINEERS AS EXPERT WITNESS

Engineers sometimes serve as consultants and provide opinion and views in many legal cases of the past events. They are required to explain the causes of accidents, malfunctions and other technological behaviour of structures, machines and instruments e.g. personal injury while using an instrument, defective product, traffic accident, structure or building collapse, and damage to the property, are some of the cases where testimonies are needed. The focus is on the past.

The functions of eyewitness and expert-witness are different as presented in the table 5.1.

Table 5.1. Eyewitness and Expert-witness

S.No	Eyewitness	Expert-witness
1.	Eye witness gives evidence on only what has been seen or heard actually (perceived facts)	Gives expert view on the facts in their area of their expertise
2.	binils	Interprets the facts, in term of thee cause and effect relationship
3.		Comments on the view of the opposite side
4.		Reports on the professional standards, especially on the precautions when the product is made or the service is provided

The engineers, who act as expert-witnesses are likely to abuse their positions in the following manners.

1. Hired Guns

Mostly lawyers hire engineers to serve the interest of their clients. Lawyers are permitted and required to project the case in a way favourable to their clients. But the engineers have obligations to thoroughly examine the events and demonstrate their professional integrity to testify only the truth in the court. They do not serve the clients of the lawyers directly. The hired guns forward white lies and distortions, as demanded

by the lawyers. They even withhold the information or shade the fact, to favour their clients.

2. Money Bias

Consultants may be influenced or prejudiced for monetary considerations, gain reputation and make a fortune.

3. Ego Bias

The assumption that the own side is innocent and the other side is guilty, is responsible for this behaviour. An inordinate desire to serve one's client and get name and fame is another reason for this bias.

4. Sympathy Bias

Sympathy for the victim on the opposite side may upset the testimony. The integrity of the consultants will keep these biases away from the justice. The court also must obtain the balanced view of both sides, by examining the expert witnesses of lawyers on both sides to remove a probable bias.

5.8.1. Duties of Expert Witness

- ✓ The expert witness is required to exhibit the responsibility of confidentiality just as they do in the consulting roles. They cannot divulge the findings of the investigation to the opposite side, unless it is required by the court of law.
- ✓ More important is that as witness they are not required to volunteer evidence for favourable to the opponent. They must answer questions truthfully, need not elaborate, and remain neutral until the details are asked for further.
- ✓ They should be objective to discover the truth and communicate them honestly.
- ✓ The stand of the experts depends on the shared understanding created within the society. The legal system should be respected at the same time, they should not act in conformance with the professional standards as obtained from the codes of ethics.
- ✓ The experts should earnestly be impartial in identifying and interpreting the observed data, recorded data, and the industrial standards. They should not distort the truth even under pressure. Although they are hired by the lawyers, they do not serve the lawyers or clients. They serve the justice. Many a time, their objective judgments will help the lawyer to put up the best defense for their clients.

5.9. ENGINEERS AS ADVISORS IN PLANNING AND POLICY MAKING

The engineers are required to give their view on the future such as in planning, policy-making, which involves the technology. Various issues and requirements for engineers who act as advisors are:

1. Objectivity

The engineer should study the cost and benefits of all possible alternative means in objective manner, within the specified conditions and assumptions.

2. Study All Aspects

They have to study the economic viability (effectiveness), technical feasibility (efficiency), operational feasibility (skills) and social acceptability which include environmental and ethical aspects, before formulating the policy.

3. Values

Engineers have to possess the qualities, such as

(a) Honesty.

(b) Competence (skills and expertise)

(c) Diligence (careful and alert).

(d) Loyalty in serving the interests of the clients and maintaining confidentiality.

(e) Public trust, and respect for the common good, rather than serving only the interests of the clients or the political interests.

4. Technical Complexity

The arbitrary, unrealistic, and controversial assumptions made during the future planning that are overlooked or not verified, will lead to moral complexity. The study on future is full of uncertainties than the investigations on the past events. In the study of energy options, for example, assumptions on population increase, life style, urbanization, availability of local fossil resources, projected costs of generating alternative forms of energy, world political scenario, world military tensions and pressures from world organizations such as World Trade Organization (WTO) and European Union (EU) may increase the complexity in judgment on future.

5. National Security

The proposed options should be aimed to strengthen the economy and security of the nation, besides safe guarding the natural resources and the environment from exploitation and degradation.

For the advisors on policy making or planning, a shared understanding on balancing the conflicting responsibilities, both to the clients and to the public can be effected by the following roles or models.

1. Hired Gun

The prime obligation is shown to the clients. The data facts favourable to the clients are highlighted, and unfavourable aspects are hidden treated as insignificant. The minimal level of interest is shown for public welfare.

2. Value - Neutral Analysts

This assumes an impartial engineer. They exhibit conscientious decisions, impartiality i.e without bias, fear or favour, and absence of advocacy.

3. Value Guided Advocates

The consulting engineers remain honest (frank in stating all the relevant facts and truth in interpretation of the facts) and autonomous (independent) in judgment and show paramount importance to the public (as different from the hired guns)

5.10. MORAL LEADERSHIP

As managers, business entrepreneurs, corporate consultants, academics, and government officials, engineers provide many forms of leadership. Moral leadership is not merely the dominance of a group. It means adopting reasonable means to motivate the groups to achieve morally desirable goals.

Leadership indicates success in moving a group toward goals. Moral leaders are individuals who direct, motivate, organize, creatively manage, or in other ways move groups towards morally valuable goals

Moral leadership is essentially required for the engineers, for the following reasons.

1. It is leading a group of people towards the achievement of global and objectives.
The goals as well as the means are to be moral.
2. The leadership shall direct and motivate the group to move through morally desirable ways.

3. They lead by thinking a head in time, and morally creative towards new applications, extension and putting values into practice. 'Morally creative' means the identification of the most important values as applicable to the situation, bringing clarity within the groups through proper communication, and putting those values in practice.
4. They sustain professional interest, among social diversity and cross-disciplinary complexity. They contribute to the professional societies, their professions and to their communities. The moral leadership in engineering is manifested in leadership within the professional societies. The professional societies provide a forum for communication, and canvassing for change within and by groups.
5. Another important avenue for providing moral leadership within communities, by the engineers is to promote services without fee or at reduced fees to the needy group. The professional societies can also promote such activities among the engineers. This type of voluntarism has been in practice in the fields of medicine, law and lawyers. But many of the engineers are not self-employed as in the case of physicians and lawyers. The business institutions are encouraged to contribute a percentage of their services free or at concessional rates for charitable purposes.
6. This is another platform for the engineers to exhibit their moral leadership. The engineers can help in guiding, organizing and stimulating the community towards morally and environmentally desirable goals. The corporate organizations have come forward to adopt villages and execute many social welfare schemes, towards this objective.

5.11. CODE OF CONDUCT

The code of ethics is a framework for arriving at good ethical choices. But anyhow, this is not merely a recipe for ethical behaviour. The code of ethics establishes a framework for ethical judgment for any profession.

Even then the code of ethics cannot be considered as a substitute for a sound judgment. A code of ethics does not develop new moral principles. Rather, it states the ways in which moral and ethical principles apply to any professional practice. It creates an environment within a profession when ethical behaviour is the basic criterion and condition. It guides or reminds how to act in any specific situation. Here some sample of conduct is given.

5.11.1. Indian Institute of Material Management

Anna University, Polytechnic & Schools

1. To consider first the total interest of one's organization in all transactions without impairing the dignity and responsibility to one's office.
2. To buy without prejudice seeking to obtain the maximum ultimate value for each rupee of expenditure.
3. To subscribe and work for honesty and truth in buying and selling.
4. To denounce all forms and manifestations of commercial bribery and to eschew anti-social practices.
5. To respect one's obligation and those of one's organization consistent with good business practice.

5.11.2. Institute of Electrical and Electronics Engineers

We the members of the IEEE, in recognition of the importance of our technologies in affecting the quality of life throughout the world, and in accepting a personal obligation to our profession, its members and the communities we serve, do hereby commit ourselves to the highest ethical and professional conduct and agree.

1. To accept responsibility in making engineering decisions consistent with the safety, health and welfare of the public, and to disclose prompt factors that might endanger the public or the environment.
2. To avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist.
3. To be honest and realistic in stating claims or estimates based on available data.
4. To reject bribery in all its forms.
5. To improve the understanding of technology, its appropriate application and potential consequences.
6. To maintain and improve our technical competence and to undertake technological tasks for others only if qualified by training or experience, or after full disclosure of pertinent limitations.
7. To seek, accept and offer honest criticism of technical work, to acknowledge and correct errors and to credit properly the contribution of others.
8. To treat fairly all persons regardless of such factors as race, religion, gender, disability, age, or natural origin.

9. To avoid injuring others, their property, reputation or employment by false or malicious action.
10. To assist colleagues and co-workers in their professional development and to support them in following code of ethics.

5.11.3. Code of Ethics of Engineers

The Fundamental Principles

Engineers uphold and advance the integrity, honor and dignity of the engineering profession by:

1. using their knowledge and skill for the enhancement of human welfare;
2. being honest and impartial, and serving with fidelity the public, their employers and clients;
3. striving to increase the competence and prestige of the engineering profession; and
4. supporting the professional and technical societies of their disciplines.

The Fundamental Canons

1. Engineers shall hold paramount the safety, health and welfare of the public in the performance of their professional duties.
2. Engineers shall perform services only in the areas of their competence.
3. Engineers shall issue public statements only in an objective and truthful manner.
4. Engineers shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest.
5. Engineers shall build their professional reputation on the merit of their services and shall not compete unfairly with others.
6. Engineers shall act in such a manner as to uphold and enhance the honor, integrity and dignity of the profession.
7. Engineers shall continue their professional development throughout their careers and shall provide opportunities for the professional development of those engineers under their supervision.

- "Prepared by the Accreditation Board for Engineering and Technology"

5.11.4. American Society of Mechanical Engineers

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I. Fundamental Principle

Anna University, Polytechnic & Schools

Engineers shall uphold and advance the integrity, honor, and dignity of the engineering profession by:

1. Using their knowledge and skill for the enhancement of human welfare,
2. Being honest and impartial and serving with fidelity the public, their employers and clients, and
3. Striving to increase the competence and prestige of the engineering profession.

II. The Fundamental canons

1. Engineers shall hold paramount the safety, health and welfare of the public in the performance of their professional duties.
2. Engineers shall perform services only in the areas of their competence.
3. Engineers shall continue their professional development throughout their careers and shall provide opportunities for the professional development of those engineers under their supervision.
4. Engineers shall act in professional matters for each employer or client as faithful agents or trustees and shall avoid conflicts of interest.
5. Engineers shall build their professional reputations on the merit of their services and shall not compete unfairly with others.
6. Engineers shall associate only with reputable persons or organizations.
7. Engineers shall issue public statements only in an objective and truthful manner.
8. Engineers shall consider the environmental impact in the performance of their professional.

5.11.5. American Society of Civil Engineers

It shall be considered unprofessional and inconsistent with honourable and dignified bearing for any member of the American Society of Civil Engineers:

1. To act for his clients in professional matters otherwise than as a faithful agent or trustee or to accept any remuneration other than his stated charges for service rendered to his clients.
2. To attempt to injure falsely or maliciously, directly or indirectly, the professional reputation, prospects or business of another engineer.

3. To attempt to supplant another engineer after definite steps have been taken towards his (or) her employment.
4. To compete with another engineer for employment on the basis of professional charges, by reducing his usual charges and in this manner attempting to underbid after being informed of the charges named by another.
5. To review the work of another engineer for the same client, except with the knowledge or consent of such engineer or unless the connection of such engineer with the work has been terminated.
6. To advertise in self- laudatory language or in any other manner derogatory to the dignity of the profession.

Canons

1. Engineers shall hold paramount the safety and welfare of the public and shall strive to comply with the principles of sustainable development in the performance of their professional duties.
2. Engineers shall perform services only in areas of their competence.
3. Engineers shall issue public statements only in an objective and truthful manner.
4. Engineers shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest.
5. Engineers shall build their professional reputation on the merit of their services and shall not compete unfairly with others.

5.12. CORPORATE SOCIAL RESPONSIBILITY

European commission defines corporate social responsibility as "the responsibility of enterprises for their impacts on society". To completely meet their social responsibility, enterprises should have a process to integrate social, environmental, ethical human rights and consumer concerns into their business operations and core strategy in close collaboration with their stakeholders.

The world business council for sustainable development defines corporate social responsibility as the continuing commitment by business to contribute to economic development while improving the quality of life of the workforce and their families, the community and society at large.

According to the United Nations Industrial Development Organization, Corporate Social responsibility is a management concept whereby companies integrate social and

environmental concerns in their business operations and interactions with their stakeholders. It is generally understood as being the way through which a company achieves a balance of economic, environmental and social imperatives while at the same time addressing the expectations of shareholders and stakeholders. Thus corporate social responsibility is a distinct strategic business management concept compared to charity, sponsorships or philanthropy. Even though the latter can make a valuable contribution to poverty reduction, directly enhance the reputation of a company and strengthen its brand, the concept of corporate social responsibility goes beyond that.

From the above definitions, it is clear that corporate social responsibility refers to the way that businesses are managed to bring about an overall positive impact on the communities, cultures, societies and environments in which they operate. Basically, corporate social responsibility implies that, corporate should be responsible enough to address social issues beside the state.

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REVIEW QUESTIONS

1. What is meant by Globalization?
2. What is contextualism?
3. What are the three senses of relative values?
4. Enumerate the international rights as suggested by Donaldson.
5. What is 'technology transfer' and 'appropriate technology'?
6. Does globalization solve the global issues?
7. Explain the meaning of environmental ethics.
8. Discuss the pros and cons of multinational companies (MNCs) from the ethical point of view.
9. What is meant by computer ethics? What is the nature of ethical problems that computers create?
10. Explain the role of engineers as managers.
11. Explain engineers as expert witnesses and advisors.
12. Write a brief account on 'consulting engineering'.
13. Discuss the engineer's role in weapon development.
14. Explain the meaning and relevance of environmental ethics.
15. Explain the meaning of moral leadership.

Two Marks and Answers**1. Define appropriate technology. [Apr / May 2021]**

Identification, transfer, and implementation of most suitable technology for a set of new situations, is called appropriate technology.

2. What are the International rights listed by Donaldson? [Apr / May 2021]

Donaldson proposes standards for international institutions by which to protect fairness and freedom, ownership of property, free speech, and minimum education and subsistence levels.

3. What is Global rule? [Nov / Dec 2020]

The term Global ethical rule refers to a set of common moral values and ethical standards which are shared by the different faiths and cultures on Earth. These common moral values and ethical standards constitute a humane ethic, or, the ethic of humanity.

4. What is CSR (Corporate Social Responsibility)? [Apr / May 2019, Nov / Dec 2018]

Corporate social responsibility means that organizations have also ethical and societal responsibilities that go beyond their economic responsibilities.

5. What is Environmental Ethics? [Apr / May 2021, Apr / May 2019]

Environmental ethics is the study to explore the ethical roots of the environmental movement and to understand what ethics tells us about our responsibility to the environment.

6. What are the demerits of MNCs to host country? [Nov / Dec 2018]

- Social and cultural disturbance
- Loss of jobs for the home country, and loss or exploitation of natural resources,
- political instability for the host countries are some of the demerits of MNCs to host country

7. What are the advantages of MNCs to host country? [Apr / May 2018]

- Inexpensive labour
- Availability of natural resources
- Conducive-tax atmosphere and Virgin market for the products

8. What is code of conduct and mention its significance? [Apr / May 2018, Nov / Dec 2016]

Codes of conduct, also referred as codes of ethics, express the commitment to ethical conduct shared by members of a profession. In other words, these codes furnish common, agreed- upon standards for professional conduct.

Significance:

- A well-designed code of conduct is a foundation for an effective ethics and compliance program.
- It is the core from which other policies and procedures are designed.

9. What do you mean by IPR? [Apr / May 2019, May / Jun 2016, Apr / May 2017] Intellectual property (IP) is a property that results from mental labour. Intellectual property is the information and original expression that derives its original value from creative ideas with a commercial value.

10. How is corporate social responsibility practiced? [Apr / May 2017]

- Corporate social responsibility (CSR) is a management concept whereby companies integrate social and environmental concerns to their business operations and interactions with their stakeholders on a voluntary basis.
- CSR is generally understood as being the way through which a company achieves a balance of economic, environmental and social imperatives, while at the same time addressing the expectation of shareholders and stakeholders.

11. What is meant by computer ethics? [Nov / Dec 2016]

Computer ethics is the study of ethical issues that are associated primarily with computing machines and the computing profession.

12. What is moral leadership? [May / Jun 2016]

When the leaders' goal is not only permissible but also morally valuable, then it is known as moral leadership. In other words, moral leadership means employing morally permissible means to stimulate groups to move toward morally desirable ends.

13. What is meant by globalization? [May / Jun 2016]

Globalization means integration of countries through commerce, transfer of technology, and exchange of information and culture.

14. What do you understand by „business ethics“? [Apr / May 2015]

Business ethics is concerned with truth and justice and has a variety of aspects such as the expectation of society, fair competition, advertising, public relations, social responsibilities, consumer autonomy, and corporate behavior.

15. What does whistle blowing mean? [Nov / Dec, 2008]

Whistleblowing is defined as conveying information by an employee, on an important moral problem to somebody in a position to take action on the problem. Further, this is done outside the approved organizational channels.

Part - B

1. What is cyber crime? Discuss in detail the various cyber crimes in the context of Ten Commandments of Computer Ethics. [**Apr / May 2021**]
2. Discuss in detail the concept of Business Ethics and Environmental Ethics in the context of technological development and for the sustenance of sustainable development. [**Apr / May 2021, Nov/ Dec 2020**].
3. Develop a model code of conduct for Multinational Corporation which is employing mainly software engineers. [**Nov/ Dec 2020**]
4. With various examples explain the various ethical issues faced by an consultant engineer. How an engineer can create a good ethical climate in any industry. [**Apr / May 2021 (Part C)**]
5. Explain the significance of Environmental Ethics for an Engineer by giving examples of environmental issue. [**Apr / May 2019 (Part C), Apr / May 2015**]
6. Discuss the ethical role of engineers as consultants with suitable examples. [**Apr / May 2018, Nov / Dec 2018**]
7. Discuss the ethical role of engineers as expert witness with suitable examples. [**Nov/ Dec 2020, Nov / Dec 2018**]
8. Discuss the ethical role of engineers in weapon development with suitable examples. [**May / Jun 2016, Nov / Dec 2018 (Part C), Apr / May 2018**]
9. Discuss in detail about the moral and ethical issues involved in use of computers. [**Nov/ Dec 2020, Apr / May 2019, Apr / May 2017**]
10. Explain the role of engineers as consultant and expert witnesses. [**Apr / May 2019, Apr / May 2017**]
11. Explain in detail the various advantages and disadvantages of MNCs. [**Nov / Dec 2016**]
12. Discuss the scope and functions of corporate responsibility. [**Nov / Dec 2016**]
13. Justify Engineers as Expert witness and advisors with suitable examples. [**May / Jun 2016**]
14. Discuss the various global issues that have an impact on business. [**Apr / May 2015**]