

The computer hardware is protected by patent. The software is protected by copyrights. We see that reproducing multiple copies from one copy of software and distribution or sales and crimes

Computer as an engineering tool:

Computers are an essential tool for an engineers.

Most often we use computers for writing documents using a word processing software package. We also keep track of appointments with scheduling software, use spreadsheets to make financial calculations, databases to keep records of our work and use commercially available software to develop plans for how our projects will proceed. The use of these types of software is not unique to engineering - indeed, they are useful in various areas of business. Unique to engineering are two uses of computers: — As design tools and As components integrated into engineered systems.

Chapter - 7  
Population and Environment

Demography is the study about population. Some basic concepts of demography :-

1. Fertility → Crude birth rate =  $\frac{B}{P} \times K$
2. Mortality ← Crude death rate =  $\frac{D}{P} \times K$   
Infant Mortality rate =  $\frac{LB}{(B)} * K$  (<sup>Live birth</sup>)
3. Migration → net migration = Immigration - out migration

■ History of world population growth :-

1800	-	1 billion
1930	-	2 billions
1962	-	3 billions
1974	-	4 billions
1987	-	5 billions
1999	-	6 billion
2010	-	6.9 billion

\* Malthusian population theory :

Population growth Geometric progression  
2, 4, 8, <sup>16</sup><sub>16</sub>, 32, 64

Food supply : Arithmetic Progression 1, 2, 3, 4, 5

Capitalistic social system:

## Demographic Transition theory

Demographic transition	Stage-1	stage-2	Stage-3	stage-4
Level of technology	Preindustrial	Industrial	Mature industrial	post-industrial
level of population growth	Very slow	Rapid	Slowing	Very slow

14.08.16

## ④ Technology and Environmental Deficit :

Sociologists point to a simple formula :

$$I = P A T$$

where

$I$  = Environmental impact

$P$  = Society's population

$A$  = Society's level of affluence

$T$  = Society's level of technology

## Environmental Ethics :

Two approach regarding environment protection

1. Cost oblivious approach

2. Cost benefit approach

[ Sustainable  
Engineering  
green Engineering ]

## Chapter-6

Computers as an Engineering Tool

Unique to engineering are two uses of computers:-

1. as design tools

2. Components integrated into engineered system.

28.04.16

\* What is technology? (Q)

Technology is the organization of knowledge, people and things to accomplish specific practical goals.

The term of processes technology is assigned to broad sweep such as finance, production, marketing, research and development, construction and personnel management.

\* Technology - the term: (emergence of technology) (Q)

Technology stems from the Greek techne which means art, craft or skill. Techne is derived from the Indo-European root teks which means to weave or fabricated. The term textile also stems from teks. Some archaeologists argue that weaving even predates agriculture, dating back to 35000 B.C.

## Purpose of technology

The term technique itself signifies a purpose. Technology is the skill and technique that is utilized to achieve a certain set of objectives. For example a fabric is produced by twisting a fibre, weaving and dyeing the twisted fibers. Hence technology is an ensemble of techniques to produce useful things.

## Technological Revolution (Q)

1. Fire is said to have been discovered 1.5 million years ago.
  2. 2.5 millions years ago tools were made of stones.
  3. Around 10,000 BC technological innovations occurred in the river valleys of Asia and Africa.
  4. Technology became imperative for agriculture, irrigation, construction, medicine and travel.
- \* Recent technological Revolution.

30.04.16

## The origin of science, technology and society:

Plato in 4th century BC in Georgia first realized the value of Engineers and went on to protest their low status in Ancient Greek society.

1527 English Francis Bacon was a scientist, lawyer and thinker in his book "The New Atlantis".

Bacon's imagination, scientist accorded the same honours as royalty and carryout their work in an organization, making scientific discoveries and turning these discoveries into technology.

### Eighteenth century (1817)

"the enlightenment" → Technological revolution  
Condorcet (philosopher) → Industrial revolution  
Condorcet (scientist) → Scientific revolution

Jacobinism, conservatism, liberalism, constitutionalism, meritocracy

## Politics

1917 Russian

1992 Russia division

1931 conference → Boris Hessen → London

of School of Newspaper } "The Social and Economic  
Roots of Newton's Principia"

Social change } 1. Navigation  
                  2. Mining (Mine)  
                  3. Weaponary revelation

J.D. Bernal  
chemist  
London

\* Five social function of  
science (book)

\* Social function — benefit of humanity

World War II - 1939

Bernal was asked to collaborate with scientists

Japan has been used for weapons research

was asked to advise with regard to

Germany after Hitler took over which

Germany had to

14.05.16

War has also had a major impact on the analysis of the role of science and technology in the society. Of particular importance was the development of the atomic bomb. The American Manhattan project was set up in 1942 in conditions of complete secrecy with the aim of making the first atomic bomb. Late in the war, the Japanese cities of Hiroshima and Nagasaki were destroyed by these bombs, forcing Japan to surrender. Many scientists who were engaged on the project later expressed regret at their involvement in the Manhattan project. For the next fifty years too, the rest of the world saw the production of huge numbers of nuclear weapons in the cold war arms race between the United States and Soviet Union and lived with the prospect of total destruction.

## Technology assessment

To assess the impact of large scale technologies on society.

\* society of f

\* social function - define -

\* Technology assessment - define -

\* world war II (technology, science & influence ??)

\* society & technology

\* politics & science & technology influence

\* science & technology to society ??

\* science & technology establish ??

16.05.16

## Classification of societies on the basis of mode of production or types of technology:

Society refers to people who interact in a defined territory and share culture. Gerhard Lenski focuses on sociocultural evolution, the changes that occur as a society acquires new technology. According to Lenski, the more technological information a society has, the faster it changes. New technology sends ripples of change through a society entire way of life.

Lenski's work identifies five types of societies based on their level of technology.

1. Hunting and gathering societies.

2. Horticultural and pastoral societies  
Permanent settlement, private property concept, leadership, fertile area, desert area

3. Agrarian Societies  
Specialization, art, population growth

4. Industrial societies

5. Post industrial societies  
+ based technology  
+ information

\* technology is the base of society? description

1st Quiz  
28/05/2016  
1st chapter

19.05.16

## and chapter

### Influence of Society and cultural Issues on technology development in Asian Countries

In the last few decades the development and application of science and technology has affected in fundamental ways the whole range of activities in manufacturing, services and agriculture. Technology

is often credited with being the single most important factor which has facilitated development in the modern western / European industrial world. In

the two and half centuries between 1473 and 1727  
are of the greatest intellectual revolution in  
human history occurred - the scientific revolution  
initiated by the work of relatively small group  
of geniuses working in the Universities of Western  
Europe. This was obviously the early beginning of

\* production →

the technological revolution and development of scientific knowledge that has taken place in recent times.

\* scientific revolution → short note

Technology culture: (define)

Technology culture refers to an attitude of individuals in a given cultural environment. The spirit of inquiry, the degree of acceptance of the right to question and be questioned is to be considered fundamental to the development of technological temper. It calls upon one to seek the 'how' 'what' and 'why' of everything that goes on in the society. The existence of a technology culture is complementary to the initiative taken by a country in the introduction of productive forces, which can lead to technological development.

It is necessary to examine the reasons which have been responsible for keeping some countries behind others in catching up with the current global technological transformation. The road blocks or the negative elements are :— (a)

1. Traditional value system and orthodoxy
2. Ancient habits of resignation
3. Stratifies and exclusive ~~society~~ societies,  
strata
4. Highly centralized Bureaucratic decision making systems discourages diffusion of ideas and technologies.
5. Education system discourages nurturing of questioning minds and has inadequate focus on tertiary education.
6. Poor connectivity with world systems and inadequate communication tools.

26.06.2016

## Theories:

Theories:  
natural environment based, political and ideological model

## 1. Utilitarianism

1. Utilitarianism

```

graph TD
    A[Utilitarianism] --> B[Egoistic]
    A --> C[Collective]
    A --> D[Altruistic]
  
```

The diagram illustrates the classification of Utilitarianism into three main types:

- Egoistic**
- Collective**
- Altruistic**

## 2. Deontology

2. Deontology  
concepts to ethical theory •  
ethics of right and wrong based on  
theoretical obligations

30.05.16

\* विमर्शन Society के तरीके "knowledge Society"

02.06.16

## China and East Asia

Evidence from earlier centuries

### Confucianism

Confucian culture lays stress on harmony, co-ordination, collective social stability and humanism.

⇒ scientific revolution, technology culture, Confucianism,

## Social shaping of technology approach

The sociology of technology is concerned with explaining how social processes, actions and structures relate to technology.  
↓  
social relationship

Donald Mackenzie and Judy waiceman, point to the

centrality of technological determinism. They refer to it as the single most influential theory of the relationship between technology and society.

Technological determinism is the notion that technological development is autonomous with respect to society. It shapes society but not reciprocally influenced. Rather it exists outside society but at the same time influences social change. In more extreme varieties of technological determinism, the technology is seen as the most significant determinant of the nature of society.

06.06.16

Technological determinism is unsatisfactory because technologies do not follow some predetermined course of development. Research and development decisions are significant determinants of the sorts of technologies which are developed. Although technologies clearly have impacts the nature of these is not built into the technology but depends on a broad range of social, political and economic factors.

The social shaping of technology approach serves as a needed and corrective and an antidote to naive technological determinism. While not denying that technologies have social effects the focus rather is on the social forces which give rise to particular technologies.

Within the sociology of technology there are two broad approaches to the social shaping of technology. The first of these focuses on micro and can be

seen in terms of two schools

- The social constructivist
- The systems or the actor network approaches.

The social constructivist approach draws on

- ① The sociology of scientific knowledge.

Here scientific facts are seen as social phenomena.

② To social constructivist technological artefacts

are socially constructed. Technologies emerge out of the processes of choice and negotiation between relevant social groups.

③ The focus on design and development

which are seen as embodying these social

processes as encompassing the social interests

which they represent.

Hughes - networks, or system approach sees system builders -

inventor, engineers, managers and financiers -

creating and presiding over technological systems.

Heterogeneous people, organizations and discipline

become part of a seamless web.

- \* How can you counter technological determinism?
- \* technological determinism unsatisfactory
- \* social shaping

07.06.16

The second broad approach is the neo Marxist. This argues that technological change cannot be fully understood by reference to individual inventions. Rather it is argued that we need to examine how wider 'macro' socio-economic forces affect the nature of technological problems and solutions. This approach criticizes the social constructivist approach for ignoring the political and economic context within which a technology developed. Technology is designed consciously or otherwise to secure particular social or political objectives. In this vein, the labor process approach looks at how the social relations of workers and management affect the nature of technologies.

Both broad approaches to the social shaping of technology then are concerned with explaining the social process of the conception, invention, design and development of technology and both approaches are embodying particular social relations. By explaining this two approaches one can counter the arguments of technological determinism.

## Chapter-3

### Topic-1

#### Ethical Perspective

Ethics: Ethics is the word that refers to morals, values and beliefs of the individual family or the society. The study on ethics helps to know the people's beliefs, values and morals learn the good and bad of them and practice them to maximize their well-being and happiness. Ethics tells us how to live, to respond to issues, through the duties, rights, responsibilities and obligations.

#### Work ethics:

Industry and society are the two systems which interact with each other and are interdependent. Society requires industry/business system which provides manufacturing, distribution and consumption activities. It needs investment, labor, supply, production, marketing and distribution and consumption. A lot of transactions between these sub-system involving people are needed.

for the welfare of the society. Here work ethics plays an essential role.

Work ethics is defined as a set of attitude, concerned with the value of work, which forms the motivational orientation. The work ethics is aimed at ensuring the economy, productivity, health and hygiene, privacy, security, culture and development, welfare, environment and offers opportunities for all without discrimination.

## Code of ethics for engineers:

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 and ethical 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 or the appearance of conflict 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 associate only with reputable persons or organizations.
7. Engineers shall issue public statements only in an objective and truthful manner.
8. Engineers shall consider environmental impact in the performance of their professional duties.

#### IV. Understanding of Ethical problem:

or theory

\* 23.06.16  
and → 3rd chap — Quiz #2

↓ ethical theories 23.06.16

\* WIPP → waste Isolation Pilot Plant

11.06.16

## Ethical theories:

There are four ethical theories:

1. Utilitarianism
2. Duty ethics
3. Right ethics
4. Virtue ethics

Utilitarianism holds that those actions are good that serve to maximize human well being. The emphasis in utilitarianism is not on maximizing the well being of the individual, but rather on maximizing the well being of society as a whole as such it is somewhat of a collective approach.

Utilitarianism tries to balance the needs of society with the needs of the individual, with an emphasis is on what will provide the most benefit to the most people.

\* Act Utilitarianism → John Stuart Mill

\* Rules Utilitarianism

\* Cost of benefit

• 13.06.16

## Duty ethics and right ethics.

A major proponent - of duty ethics was Immanuel Kant. Ethical actions are those actions that could be written down on a list of duties - be honest, don't cause suffering - to other people, be fair to others etc. The actions are our duties because they express respect for persons.

Rights ethics was largely formulated by John Locke, whose statement that humans have the right to life, liberty and property. Rights ethics holds that people have fundamental rights that other people have a duty to respect.

Duty ethics and right ethics are really just two different sides of the same coin. Both of these theories achieve the same end. Individual persons must be respected and actions are ethical that maintain this respect for the individual.

In duty ethics, people have duties, an important one of which is to protect the rights of others. And in rights ethics people have fundamental rights that others have duties to protect.

### Virtue ethics:

~~Virtue is often de~~  
Virtue ethics is interested in determining what kind of people we should be.

Virtues — honesty,  
competence  
loyalty  
Responsibility.  
trustworthiness,  
~~fair~~ fairness -  
caring  
citizenship and  
respect

How can virtue ethics be applied to engineering situations?

Is this action honest?

Will this action demonstrate loyalty to my community / employer?

Have I acted in a responsible fashion?

## Biomedical Engineering ethics?

Biomedical engineering is the application of engineering principles and techniques to medicine. It combines expertise in engineering with expertise in medicine and human biology to develop technologies and techniques for health care and patient care.

Biomedical engineering emerged as a field after World War II and has expanded ever since. As a field, it is very broad with applications ranging from molecular imaging to construction of artificial hearts. Biomedical engineering is narrower in scope than bioengineering. Bioengineering focuses on the engineering of biological processes and systems in general, and includes not only biomedical engineering but also agricultural engineering, food engineering and biotechnology.

## General Ethical issues & (in Biomedical engineering)

### ↳ RND (Research and development)

Principle follow are:

- 1) Beneficence (benefiting patients)
- 2) Non-maleficence (doing no harm)
- 3) Patient autonomy (the right to choose or refuse treatment)
- 4) Justice (the equitable allocation of scarce health resources)
- 5) Dignity (dignified treatment of patient)
- 6) Confidentiality (medical information)
- 7) Consent (consent to treatment based on a proper understanding of the fact)

Some specific fields of biomedical engineering and major ethical issues.

1. Cellular, Genetic and Tissue engineering
2. Biomaterials, Prostheses and implants.
3. Biomedical imaging and optics.
4. Neural engineering

1) Cellular engineering is a field that attempts to control cell function through chemical, mechanical, electrical or genetic engineering of cells. It attempts to understand disease processes at the cellular level and to ~~intervene~~ intervene by means of miniature devices that stimulate or inhibit cellular processes at targeted locations to prevent or treat disease.

Genetic engineering specifically aims to control the genetic material in cells. Most research goes into somatic cell therapy, which is the genetic modification of bodily cells, in order to

replace defective genes with functional ones. It is being clinically tested to treat inheritable diseases, cancer, diabetes and various ~~neurodegen~~ neurodegenerative disorders. There is now considerable agreement to somatic cell gene therapy to treat serious diseases ~~is~~ ethical.

Tissue engineering is a field that aims to restore, maintain or improve the functioning of tissues or whole organs by means of biological substitutes that repair or replace these tissues or organs. One of the goals of tissue engineering is to create artificially grown organs for patients that need organ ~~to~~ transplants. Major moral controversies in tissue engineering concern the use of xenogenic and human embryonic tissue. The use of xenogenic cells and cell material is controversial because species boundaries are crossed in the process. It involves the creation and medical use of cells and

tissues that by origin are part human part animal or plant. The use of ~~emb~~ embryonic tissue is controversial because cells are harvested from human embryos which are destroyed in the process. It has been objected that it is unethical to kill or destroy human embryos and therefore have a medical practice.

The nature of industrial Production

We need to think about the form of industrial production and consider just what it takes in to manufacture goods — either goods for direct consumption or capital goods designed to produce consumer goods. In the first place it is obviously necessary to know how to change raw material into finished product and it is necessary to have requisite technology.

Knowing how to produce something is not of course enough. One needs capital to rent or buy premises, factories, equip them with the necessary machines, buy the raw materials and one needs labor. One needs classical factor of production such as capital and labor. Capital can be defined as capital goods like machines and factories together with raw materials, but in many way, it is easier to think

of it as money ~~is~~ that it is invested, or is available for investment in production. It is necessary to have labour - spinners, weavers etc. to actually perform work. There is also the need of some one or some group to put all these together.

21/07/16

Quiz 3

chapter- 3 & 4

~~extremely~~

14.07.16

## Chapter- 4

### The concept of economic growth:

Economic growth is measured by an increase in the gross domestic product in a given period - usually over one year. All the nations of the world, and probably most of the people in the less developed nations, regard economic growth as desirable and necessary.

On the other hand environmentalists are quite legitimately questioning whether rapid economic growth can continue in a finite world with a fragile ecology longer

Often growth is defined in terms of the use of natural resources. In the long run this economic growth would appear to be unsustainable. Norman Clark defined 'economic growth' as the rate of change of the capacity of any economic system to produce goods and services for the consumption and investment requirements of its citizens.

\* Saving == investment

\* foreign investment विदेशी निवेश → विदेशी निवेश और अर्थव्यवस्था

16.07.16

## Factors correlating with GDP growth rate:

\* capital - संसाधन

\* human capital - मानव संसाधन

\* social capital - सामाजिक संसाधन

Economists have carried out much research on economic growth and suggest that there are many factors which correlate positively with it. Some of these have been summarized by Grossman and Helpman —

1. Investment to output ratios.
2. Qualities of the human capital stock.
3. Export as a large share of output.
4. The number of scientists and engineers employed in research.

\* economic growth → (school enrollment, literacy rate) depends

Recent perspectives on science, technology and Economy:

\* product के बदलावों के लिए नई बाज़ारों को बढ़ावा देना और नए बाज़ारों को बढ़ावा देना

18.07.16

## Technical change and economic growth

### sustainable Economy



5 machines  
1 workshop/factory  
100 work

### Technical change

more productive capacity  
1 machine, bigger, faster and more productive capacity  
1 worker

### Technological improvement

Ahsa  
size

## chapter-5

### Globalization and Human rights

#### concept of Globalization:

Globalization means integration of ~~each~~ countries through commerce, transfer of technology and exchange of information and culture. In a way it includes acting together and interacting economics through trade, investment, loan, development schemes and capital across countries. In a different sense, these flows include knowledge, science, technology, skills, culture, information and entertainment, besides direct human resource, tele-work and outsourcing. This interdependence has increased the complex tensions and ruptures among the nations. For the engineers, the issues such as multinational organizations, computer, internet functions, military development and environmental ethics have assumed greater importance for their very sustenance and progress.

## Multinational Corporation:

Organization who have established business in more than one country are called multination corporation. The head quarters are in the home country and the business is extended in many host countries. The western organizations doing business in the less economically developed countries, gain the advantages of inexpensive labor, availability of natural resources, conducive tax atmosphere and vast 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 benefits. But this happens invariably with some social and cultural disturbance. Loss of job in the home countries and loss <sup>or</sup> exploitation of natural resources, political instability for the host countries are some of the inventures of globalization.

## 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 smoother the transaction when the engineers and employers of MNC's have to interact at official, social, economic and sometimes political levels. At international level, the organization 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 ~~to~~ violence and fraud -
- c) Basic fairness and practical justice in case of conflicts.

Ten international rights to be taken care of in this context 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 gadget have to ~~not~~ 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 minimum education.

9. Right to participate in cultural, economic and social life.

10. Right to political participation.

11. Right to live and exist. The individual liberty and sanctity of the human life are to be respected by all societies.

23.07.16

## Technology Transfer

It is a process of moving technology to a new setting and implementing it there. Technology includes hardware and the techniques. It may mean moving the technology application from laboratory to the field / factory or from one country to another. This transfer is effected by governments, organizations, Universities and MNCs.

## Appropriate technology:

Identification, transfer and implementation of most suitable technology for a set of new situations is called appropriate technology. Factors such as economic, social and engineering constraints are the causes for the modification of technology. Depending on the availability of resources, physical conditions, capital opportunity, cost and the human value system which includes their traditions, beliefs and religion, the upper appropriateness are to be determined.

For example; small farmers in our country prefer to own and use the power tiller, rather

than the high powered tractors or sophisticated harvesting machines. On the other hand, the latest technological device, the cell phones and wireless local loop phones have found their way into remote villages and hamlets than the landline telephone connections.

### How appropriate is aptech? appropriate technology

1. A case against the technology transfer is that the impact of borrowed or transferred technology has been threatening the environment beyond its capacity and sustainable development of the host countries. Large plantations that orient their efforts to export leave the small farmers out of jobs and at the mercy of the foreign country. For example, genetically modified cotton have shown sufficient disturbance in Europe and Africa. This has made the European

Union to oppose the entry of GM cottons into Europe.

2. The high technology has contributed to large scale migration from villages to the cities where corporations are located, leading the undesirable side effects of over crowding of cities, such as the scarcity of water, insanitation, poverty and the increase in crimes.

3. The term appropriate should emphasize the social acceptability and environmental protection of the host countries and this need to be addressed while transferring technology. Thus we confirm the view that engineering is a continual social experimentation with nature.

28.07.16

## MNCs and Morality

The economic and environmental conditions of the home and host countries may vary. But the multinational institutions have to adopt appropriate measures not to disturb dislocate the social 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 technical 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 set up of the host countries.

5. Multinational organizations should provide fair remuneration to the employees of the host countries. If the remunerations is high as that of home country, this may create tensions and if it is too low it will lead to exploitation.

6. Multinational institutions should provide necessary safety for the workers when they are engaged in hazardous activities and informed consent should be obtained from them. Adequate compensation should be paid to them for the additional risks undertaken.

30.07.16

## The Bhupal Gas Tragedy:

Technologically the tragedy was caused by a

series of events :—

① the safety manual of union carbide prescribed that the MIC tanks were to be filled only up to 60% of the capacity. But the tanks were reported to have been filled up to 75%.

② the safety policy prescribed that an empty tank should be available as a stand bye in case of emergency. But the emergency tank was also filled with upto its full capacity. These facts confirmed that the MNC had not followed and implemented appropriate safety standards of the home country in the host country. Can this be called as example of ~~miss~~ & inappropriate technology?

3. The storage tanks should be refrigerated to make the chemical less reactive. But here the refrigeration system was shut down as an economy measure. This raised the temperature of the gas stored.

4. The plant was shut down for maintenance two months earlier. The worker who cleaned the pipes and filters, 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.

5. When the gas started leaking out, the operators tried to use the vent gas scrubber that was designed to reduce the exhausting gas. But that scrubber was also shut down.

04.08.16

6. There was a flare tower that was designed to burn off the gas escaping from the scrubber. That was not also working conditions.

7. The workers finally tried to spray water up to 100 feet to quench the gas but the gas was escaping from the chimney of 120 feet high.

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

The gas escaped into the air and spread over 40 sq km. About 600 people died and left 7000 injured and the health of about 2 million people was affected adversely. Even after 22 years, influence of central Government and the courts the compensation had not reached all the affected People.

## Chapter - 6

### Information Technology

Computer Ethics: Computer ethics is defined as

a) Study and analysis of nature and social impact of computer technology. b) formulation and justification of policies, for ethical use of computers. This subject has become relevant to the professionals such as designers of computers, programmers, system analysts, system managers and operator. The use of computers have raised a host of moral concerns such as free speech, privacy, intellectual property right and physical as well as mental harm.

 Computer as the instrument of unethical acts.

a) The usage of computer ~~reptys~~ replaces job positions. This has been overcome to a large extent by readjusting work assignments and training everyone on computer applications such as word processing, editing and graphics.

b) Breaking privacy: Information or data of the individuals accessed or erased or the ownership changed

3) Defraud: Defraud a bank or a client, by accessing and withdrawing money from other's bank account.

Example: If a lawyer withdraws funds from his client's bank account for his own personal use, he has committed a crime.

Another example: If a lawyer withdraws funds from his client's bank account for his own personal use, he has committed a crime.

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## Computer as the object of unethical Act :-

- a) Hacking :— The software is stolen or information is accessed from other computers. This may cause financial loss to the business or violation of privacy rights of the individuals or business. In case of defense information being hacked, this may endanger the security of the nation.
- b) Spreading virus :— Through mail or otherwise, other computers are accessed and the files are erased or contents changed ~~altogether~~ altogether. ~~The~~ "Trojan horses" are implanted to distort the messages and files beyond recovery. This again causes financial loss or mental torture to the individuals. Some hackers feel that they have justified their right of free information or they do it for fun. However, these acts are ~~not~~ unethical.

problems related to the autonomous nature of computer:

a) Security risk:- Recently the Tokyo Stock Exchange faced a major embarrassment. A seemingly casual mistake by a junior trader of a large security house lead to huge losses including that of reputation. The order through the exchange's trading system was to sell one share for 600,000 Yen. ~~is~~ Instead the trader keyed in a sale order for 600,000 shares at the rate of one yen each. Naturally the shares offer at the ridiculously low price. And only a few buyers agreed to reverse the deal. The loss of the firm was several hundred thousands. Such an obvious mistake could not be corrected by some of the advanced technology available.

b) loss of lives: Risk and loss of human lives lost by computer, in the operational control of military weapons. There is a dangerous instability in automated defense system. An unexpected error in the software or hardware or a conflict during interfacing between the two, may trigger a serious attack and cause irreparable human loss before the error is traced. The Chinese embassy was bombed by U.S. military in Iraq a few years back, but enquiries ~~revealed~~ revealed that the building was shown in a previous map as the building insurgents stayed.

प्रकृति

## Computers in workplace

### ① Elimination of routine and manual jobs:

This leads to unemployment but the creation of IT enabled service jobs are more advantageous for the people. Initially this may require some upgradation of their skills and knowledge, but a formal training will set this problem right. For example, in place of a typist, we have a programmer or an accountant.

### ② Health and safety:

The ill effects due to electro magnetic radiation, especially on woman and pregnant employees, mental stress, wrist problem and back pain due to poor seating designs and eye strain due to poor lighting and flickers in the display and long exposure, have been reported worldwide. Over a period of long exposure, these are expected to affect the

health and safety of people. The computer designers should take care of these aspects and management should monitor the health and safety of the computer personal.

### Computer failure:

Failure in computers may be due to error in the hardware or software. Hardware errors are rare and they can be solved easily and quickly. But software errors very serious as they can stop the entire network. Testing and quality systems for software have gained relevance and importance in the recent past, to avoid or minimize these errors.

## Property Issues:

1. Computers have been used to extort money through anonymous telephone calls.
2. Computers are used to cheat and steal by current as well as previous employers.
3. Cheating of and stealing from the customers and clients.
4. Violation of contracts on computer sales and services.
5. Conspiracy as a group, especially with the internet, to defraud the gullible, stealing the identity and also forge documents.
6. Property is what the laws permits and defines as can be owned, exchanged and used.