

24/04/'17

Chapter - I

Historical Perspective of Technology

What is technology?

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

Sociologists Gerhard Lenski has defined technology as, "information about how to use the material resources of the environment to satisfy human needs and desires." According to Horton and Hunt, "Technology is the use of scientific discoveries to solve practical problem."

In simple words, technology refers to the practical application of knowledge about nature.

Technology the term

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

Purpose of Technology

The term techne 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 fibres. Hence technology is the ensemble of techniques useful to produce useful things.

The origins of science, technology and society

4th century BC. Plato — a philosopher

Francis Bacon — 1527

British lawyer and thinker

The book "The New Atlantis"

and Robert Boyle in 1661 —

the first book of philosophy

triangular pyramid

square

triangle

circle

triangle

square

circle

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Eighteenth Century -

L The period of enlightenment

Marx and Lenin argued that a socialist state like the Soviet Union represented a higher stage in social development than the liberal democracies of the West. One part of this theory was the materialist interpretation of history, which held that all significant social and actual change is caused by change in the productive forces of the economy. Of course, this places technology at the very heart of historical change.

Marxist view of Science - In 1931 in London, Boris Huseyn presented a paper called 'The Social and Economic Roots of Newton's Principia.'

- ① Navigation
- ② Mining
- ③ Weaponary development.

Chemist J. D. Bernal (1934)
London University Professor

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L writes a book called 'The Social Function of Science' in 1939.

- The improvement of the lot of humanity
- Many other scientists protested against his concept since they believed that science can never be directed. So they form a organisation called 'Freedom of Science.'

How does war influence science and technology?

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 atomic bomb. The American Manhattan Project was set up in 1942, in condition of complete secrecy with aim of making the first atomic bombs.

- It was used in 1945 in Japan and scientists involved in it regretted its use against humanity.
- After WW2, all govt. decided to invest in science and technology to survive and progress. This goes back to directing science (Bernal).

Bernalism and its agreement after WW2

Perhaps the most dramatic of these development took place in the US. A distinguished scientist, Vannevar Bush, was asked to report on a suitable plan for science after WWII. Bush recommended the setting up of a National Research Foundation

which later became the National Science Foundation. He also wrote the book a report, Science, The Endless Frontier, which advocated the setting up of a national policy concerned with science.

- The main purpose of the policy was to use the limited fund most efficiently. It is not wise for a govt. to spend most of its budget in weaponry.
- Scientists and engineers need to be prepared to decide which projects to be funded and they need to be evaluated to see if the chosen projects are running efficiently.

Technology Assessment

In our society, when a large scale technology is launched, its impact must be assessed prior to launching it to bring about the positive impact and negative impact reduced.

(Chennai) during frontiers of
technology at the meeting -
Government of India has a
policy to assess the impact of
any technology before launching it.

4/05/17

1st Quiz - This class + 1
13/05/17

Classification of societies based on Technology / mode of subsistence

Gerhard Lenski focuses on sociocultural evolution, the changes that occur as a society acquire 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's 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
3. Agrarian societies
4. Industrial societies
5. Post industrial societies

material : tangible things

Culture

non-material : beliefs, ideas,

ideology, behaviour,

attitude etc

most important resource

Chapter - 2

Influence of Society and Cultural issues on technology development in Asian countries.

In the last few decades of development and application of science and technology has affected in whole range of activities in manufacturing, services and agriculture. The technology content is significantly increasing in all products and services which a businessman/industrialist/agriculturalist wishes to produce and provide. 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 one of the greatest intellectual revolution in human history occurred—the scientific revolution—initiated by the work of a relatively small group of geniuses working in the universities of western Europe. This was obviously the early beginning of the technological revolution and development of scientific knowledge that has taken place in recent times.

The beginner or pioneers of scientific advancements began before 1473 by Indian and Islamic revolution. But in recent times, Asian countries are behind and the western Europeans who were the borrowers are now more advanced. This topic discusses the reasons behind them.

Technology Culture

Technology culture refers to an attitude of individual 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 a initiative taken by a country in the introduction of productive forces, which can lead to technological development.

It is now 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 reasons are:-

1. Technological traditional vague system and orthodoxy.
2. Ancient habits of resignation
3. Stratified and exclusive societies
4. Highly centralized or bureaucratic decision making systems discouraging 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

===== Owing to here

08 / 05 / '17

4. Due to fear of corruption.
 - 5.
 6. Diffusion of technology requires communication in order to cope with them.

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China and East Asia

Evidence from earlier centuries: - The Chinese were the first accurate astronomical observers. Systematic records of solar eclipses began in 1361 BC; of Haley's Comet in 467 BC; of sunspots in 28 BC. Accurate measurements of time was perfected by 723 AD. Joseph Needham's instrumental work on Chinese science and technology of the earlier times has made him a legend in his own time. In his books, he has recorded that Chinese were first to use the mariner's compass, had treatment for deficiency diseases with a vitamin-rich diet, recommended iodine rich sea weed diet for treatment of goiter, developed drugs and medicines for treatment of hormonal disorders. The wheelbarrow, porcelain, silk technology, the mill wheel, the paddle wheel, papermaking, the windmill, gunpowder, cast iron, printing from movable types and of course acupuncture are just a short list of the technological innovations by Needham. In addition there is the immense achievement of hydraulic engineering - canals for navigation, drainage and irrigation - far surpassing anything known in the West until the mid-nineteenth century. The blast furnace was introduced in Europe on a wide scale, only in the late 14th century; almost 2000 years after Chinese developed it. Until the thirteenth centuries they were the world leaders in developing new technologies.

Cultural Dimensions:-

Confucianism - Confucius's principles

Affected not only China but Japan, Korea etc. as well

~~It is~~

Confucian culture lays stress on harmony, coordination, collective social stability and humanism.

However, modernization slowed down due to stressing on Confucian culture since they were not able to accept new technology due to stressing more on harmony. (Not all individuals of society can accept new tech at the same time.)

Japan realised this and start a campaign to end Confucianism and pro-Europeanism. The feudal leaders

Confucianism still affects China. New leaders misunderstood Confucianism and fed society; New leaders changed that and adjusted and developed Confucianism, emphasises more on art and literacy, according to them.

Opposites: Capitalism vs. Socialism - Capitalism, Silver bullet to solve all our present problems of - Capitalism has new currency called art. writers like Chen - Sun left their wall of beggars (poor) with deep and dark emotions in their art which blew off new fresh air through its streets with銀色的光輝

Chapter - 3The social shaping of technology:-

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

Donald Mackenzie and Judy Wajcman 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.

Technological determinism is unsatisfactory because technology 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 (SST) approach serves as needed corrective and an antidote to naive technological determinism. Not denying that technologies have social effects, the focus rather is the

social forces which gives rise to particular technologies

Within sociology of technology, there are two broad approaches to the social shaping of technology —

— the first is micro approach

— macroapproach

① — System network approach

↳ 4 growth dependant development

— Inventors

— Engineers

— Managers

— Financiers

Invents

Makes it reality

Manages the organisation

Where developed

Finance needed for growth

② Macroapproach — Neo Marxist approach

Labour process — conflict / contradiction between

capitalist and wage workers causes capitalists

to invest in technology in fear of the wage

workers revolting and thus technology advances

Problems arising out of lack of systematic control over scientific and technological innovation.

① Problems related to the nature and qualities of environment.

② Distortion of the priorities of the research matters and efforts

③ Highly technological society posing a possible threat to Democracy.

① Excessive use of land and excessive fertilisation cause harm to the soil.

② Food additives used excessively causes many diseases such as cancer etc.

③ Atmospheric pollution caused by pollutants such as CFC etc. & The ozone layer is getting depleted. Also ice is melting due to global warming and fresh water sources are getting polluted. Also, harmful radiation is a product of excessive industrialisation as well.

① Life saving drugs.

② Technology needed for the disabled people by radiation.

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Highly technological society posing possible threat to democracy.

Technocracy.

rule by technical experts who play their role behind the scenes.

decisions by them can be highly disastrous for society.

any decision must be analysed by many people such as analyst, economists, psychologists, etc.

the analysis of the work
of business modelling, management
and planning is based on the analysis
of the problem with the help of
various techniques of business
modelling and management.

such firms often
work closely with
the government
and business
models.

Chapter - 3

Ethical perspective of technology

Definitions of ethics: Ethics is a set of beliefs about what is right and wrong behaviour within a society. Ethics is derived from the Greek ethos and the term morality has its roots in the Latin mores. Both the Greek and Latin terms refer to notion of custom, habit, behaviour and character. Although ethics and morality are often used interchangeably in the everyday discourse, we saw some important distinction between them. First we define ethics as the study of morality.

- moral dilemma: neither of two choices is not desirable. So, the choice must be made of the less evil.

Moral system: Morality can be defined as a system of rules for guiding human conduct and principles for evaluating those rules.

Note that i) morality is a system
ii) it is a system comprised of moral rules and principles.

There are two kinds of conduct.

Rules of conduct

(action guiding rules, in the form of either directives or social policies)

principles of evaluation

(evaluative standards used to justify rules of conduct -)

Two types

Rules for guiding the action of individuals
(micro level ethical rules)

rules for establishing social policies

(macrolevel ethical rules)

Examples include, social policies such as "software should be protected" and "privacy should be respected."

Examples include, directives, such as "do not steal" and "do not

harm others." These are principles of action.

The difference between morals, ethics and laws

The difference between morals, ethics and laws

Morals are one person's beliefs about right and wrong, while the term ethics describes standards or codes of behaviour expected of an individual by a group (nation, organisation, profession) to which an individual belongs. For example, the ethics of the law profession demand that defense attorneys defend an accused client to the best of their ability, even if they know that the client is guilty of the most heinous and morally objectionable crime one could imagine.

Law is a system of rules that tells us what we can and cannot do. Laws are enforced by a set of institutions (the police, courts, lawmaking bodies). Legal acts are acts that conform to law. Moral acts conform to what an individual believes to be the right thing to do. Law can proclaim an act as legal, although many people may consider the act immoral. For example, abortion.

Code of ethics for engineers (According to National Society of Professional Engineers).

Engineering is an important and learned profession. As members of this profession, engineers are expected to exhibit the higher standards of honesty and integrity. Engineering has a direct and vital impact on the quality of life for all people. Accordingly, the services provided by engineers require honesty, impartiality, fairness and equity and must be dedicated to the protection of the public health, safety and welfare. Engineer must perform under a standard of professional behaviours that require adherence to the highest principles of ethical conduct.

Engineers in the fulfillment of their professional duties shall :-

- ① hold paramount the safety and welfare of the public.
- ② perform services only in the areas of their competence.
- ③ issue public statements only in objective and truthful manner.
- ④ act for each employer or client as faithful agents or trustees.
- ⑤ avoid deceptive acts.
- ⑥ conduct themselves honourably, responsibly, ethically and lawfully so as to enhance the honour, reputation and usefulness of the profession.

22/05/17

Brief History of ethical thought:

↳ from Western cultural tradition.

- originated from Middle East and Europe.
- not from single source; many - of which some are roots
- thinking of the ancient Greeks, ancient religious thinking.
- Ancient religious thinking is influenced by ancient Greek philosophers, of which the two most influential were Aristotle and Socrates.
- The philosophy of ancient Greeks matches with that of Christians and Jews.
- With time, the ideas of ethical thought changed philosophies are used to solve engineering problems since they are not religion based. They are Cokke, Mill and Kant.

Ethical Moral Theories:

- ① Utilitarianism
- ② Duty ethics and right ethics
- ③ Virtue ethics

Utilitarianism

Utilitarianism holds that those actions are good that serve to maximise 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. This is why it is sometimes also known as collective approach.

Eg: Damming an area → to protect from flood
→ freshwater
→ recreational purpose

This is extremely disastrous for some individuals since they are required to leave the land, which is why when a dam is to be built, those individuals are compensated in many ways.

Eg: WIPP (Waste Isolation Pilot Plant) —
a project where nuclear waste from US was dumped by tunneling after geographical survey. However, some protested against it since the site was near a highway and may cause accident. But, utilitarian analysis showed that it will facilitate many US technological developments such as in medicals, nuclear energy generation.

Thus, despite causing some threat, it will facilitate society as a whole.

Problems of utilitarianism:-

- ① individual harm neglected
- ② the benefit is possible but not guaranteed
- since its analysis is extremely difficult. Thus, in case if sth goes wrong, the harm will be on a large scale.

Utilitarianism

Act

utilitarianism

Rule

utilitarianism

which satisfies every being's want -
Individual act from which more happiness
is obtained the happiness will be

more if utility has been increased

utility of the thing

desire - for ad - individual

of pain, the same thing -

stop -

want -

Cost - benefit analysis

In cost benefit analysis, the cost of a project are assessed as are the benefits. Only those projects with the highest ratio of benefits to cost will be implemented.

The goal of cost benefit analysis is to determine the feasibility of a project, based on cost. When looking at an ethical problem, the first step should be to determine what the right course of action is and then factor in the financial costs in choosing between ethical alternatives

- Only economic side analysed.
- From ethical point of view, whichever is the right course of action must be implemented and then economic side must be analysed.

Duty ethics and right ethics

proponent of duty ethics



Immanuel Kant — be ~~most~~ honest.

- don't cause suffering to other people.
- be fair.

Right ethics

John Locke

Human have the right of life, liberty and property.

Right ethics say that an individual has the right to enjoy own property. According to it, the dam can't be built. But in most cases, utilitarianism is used to solve problems.

Virtue Ethics:

Virtue ethics is interested in what kind of people we should be. according to some theory of Virtues are - responsibility, honesty, fairness, caring, citizenship, respect, loyalty, competence, trustworthiness.

Some vices are - dishonesty, disloyalty, irresponsibility, incompetence.

How can virtue ethics be applied to business and engineering situations?

We can use virtue ethics in our engineering career by answering questions such as:

Is this action honest?

Will this act demonstrate loyalty to your community or your employer?

Have I acted in responsible fashion?

Personal vs. Professional ethics:

Personal life's ethics has an impact on professional life ethics. However, at times some problems are faced in professional life which were never faced in personal life.

Biomedical Engineering Ethics

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

Biomedical engineers are sometimes called medical practitioners though there are many differences.

Biomedical engineering began after WW2. Therefore, they have no separate ethics. They follow the ethics of engineers and doctors.

(which are probably similar to medical ethics of doctors and nurses)

whereas of engineers

(engineers' code of ethics)

(obeying to the interest of society)

(actions of an engineer for the welfare of society)

(not to let damage to society by actions of an engineer)

(actions of an engineer for the welfare of society)

(actions of an engineer for the welfare of society)

27/05/17

General Ethical Issues

In biomedical engineering, a distinction can be made between ethical issues in R & D practice and ethical issues regarding the implications of developed techniques and devices for medical practice. Biomedical engineers have a responsibility to anticipate on the consequences of their designs for medical practice and to ensure that technologies and techniques are designed in a manner consistent with and supportive of ethical principles for medical practice. Such principles are:-

- ① Beneficence (benefiting patients)
- ② Nonmaleficence (doing not 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 (of medical information)
- ⑦ Informed consent (consent to treatment based on a proper understanding of the facts.)

Human enhancement :
when technology developed

main diagnosis
therapy

but super-human making technologies conflict
with these and are ethically questionable. It is
yet one of the controversial aspects of human
enhancement.

Some specific fields of biomedical engineering and
major ethical issues:

1. Cellular, genetic and tissue engineering

2. Biomaterials, prosthesis and implants

3. Biomedical imaging and optics

4. Neural engineering

1. The function of cell is controlled. Using extremely
precise technology, a specific cell can be targeted
and its function can be stimulated or inhibited.
Genetic engineering specifically aids the genetic
material of DNA. Somatic cell therapy is a genetic
modification of body cells which are diabetic, neuro-
degenerative and cancerous. There is agreement that this
is an ethical way of treating serious diseases.

Tissue engineering helps to restore tissue. It involves
organ transplant and organ growing. Major moral
controversies in tissue engineering -

Xenogenic

Human embryonic tissue

Xenogenic → animal or vegetative
↓
part human, part animal or plant
traditional difference no longer there thus
ethically questionable.

Human embryo → many embryos are being destroyed
during experiments for
treatment of infertility.
→ donor's consent needs to be
involved upon selling the tissue
stored in biobank

2. Identity as humans questioned.

3. Ethical questions:
When one disease is checked and others
is found whose treatment is not there. This
puts both the doctor and patient at a psychological pressure.
— brain imaging → mental state or plant to do

— electronic data processing → data manipulation

4. Engineering + neuroscience: restoration and
augmentation of human function.

Eg: brain-computer interfaces

— autonomy not there.

— can humans still be held responsible for
their behaviour whose brain is controlled

by others.

Quiz 2
10/06/17

Chap - 2 & 3

29/05/17

Chapter - 4

The impact of information technology on productivity and quality of life

GDP - Gross Domestic Product (per capita)

L to measure quality of life.

National - total annual or income of the nation.

per individual

The GDP of industrialised countries is increasing faster than developing countries.

The rates of GDP change vary based on:-

business cycle that affect prices, wages, employment levels and the production of goods and services.

The worst economic downturn happened in USA in 1929 - 1939. GDP declined by 50%. Unemployment rates had reached 25%.

Another economic downturn occurred beginning in 2007 where GDP declined by 6.8%.

Unemployment rate hit peak of +10% to 10.2% in 2009. These downturns occurred despite the country being highly technologised.

IT Investment and productivity

Productivity is defined as the amount of output produced per unit of input. It is measured by -

① Productivity in a factory might be measured by the number of labor hours it takes to produce an item.

② Productivity in a service sector company might be measured by annual revenue an employee generates divided by the employees annual salary.

Increase in productivity is not proportional increase in input, but is due to technological change.

making production more efficient.

Innovation is a key factor in productivity improvement.

IT plays an important role in enabling innovation. Progressive management

team uses IT, new technology & Capital

investment to implement innovation

in products, process and services

with focus on efficiency, cost reduction

and quality improvement.

IT investment can be used to improve

productivity and reduce costs.

1/06/17

~~Early days of IT in the 1960s, productivity improvements~~

In the

Early days of IT in the 1960s, productivity improvements were easy to measure. Midsized companies often had a dozen or more accountants focused on payroll related accounting. When business implemented automated payroll system, fewer accounting ~~as~~ employees were needed. The productivity gains from such IT investments were obvious.

IT can enhance productivity in fundamental ways by allowing firms to make radical changes in work process but such major changes can take years to complete because firms must make substantial complementary investments in — retraining, reorganizing, changing reward system. Furthermore, the effort to make such a conversion can divert resources from normal activities which can actually reduce productivity — at least temporarily.

Many other factors influence workers' productivity besides IT.

- ① The overall economic climate.
- ② The flexibility of the labor market.

- ③ The actions taken by private industry.
- ④ Various government entities.
- ⑤ Financial sector.
- ⑥ Changes in supply and demand.

Additional factors that can affect national productivity rates:

- ① Labor productivity growth rates differ according to where a country is in the business cycle — expansion or contraction. Times of expansion enable firms to gain full advantage of economic scale and full production. Times of contraction present fewer investment opportunities.
- ② Outsourcing can skew productivity if the contracting firms have different productivity rates than the outsourcing firms.
- ③ Regulations make it easier for companies in the US to hire and fire workers and to start and end business activities compared with many other industrialised nations.
- ④ More competitive markets for goods and services can provide greater incentives for technological innovations and adoption as firms strive to keep ahead of competitors.

⑤ In today's service based economy it is difficult to measure the real output of services as accounting, customer services and consulting.

⑥ IT investments don't always yield tangible results. Many produce intangible benefits such as improved quality, reliability and services.

IT investments can also lead to increased efficiency, better quality, reduced costs, and improved customer satisfaction. However, IT investments can also lead to increased costs, reduced efficiency, and decreased customer satisfaction. This is because IT investments can be expensive and require significant resources. Additionally, IT investments can be difficult to manage and maintain, which can lead to increased costs and decreased efficiency. Finally, IT investments can be difficult to evaluate, which can lead to decreased customer satisfaction.

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3/06/17

Telework

- ① Telework is a work arrangement in which an employee works away from the office — at home, at a client's office, in a hotel + literally anywhere.
 - ② In telework, an employee uses various forms of electronic communication, including texting, email, audio, videoconferencing and online chat.
 - ③ Teleworkers access the internet via smartphones, tablets, laptops and similar devices to retrieve computer files, log on to software application, access corporate databases and communicate with fellow employees, managers, customers and suppliers.
 - ④ The goal of telework is to allow employees to be more effective and productive from wherever they are.
- Factors that have increased the prevalence of telework

- ① Advances in technology that enable people to communicate and access the internet from almost anywhere.
- ② The increasing number of broadband connections in homes and retail locations.
- ③ High levels of traffic congestion.
- ④ Rising gasoline prices.

- ⑤ Growing concern over the effects of automobile CO₂ emissions.
- ⑥ Scarce and highly trained workers more frequently demand more flexible work arrangements including flex hours and the ability to occasionally work from home.

Advantages:-

- people with

Advantages and disadvantages of teleworking for employee

- people with disabilities who are efficient find public transportation and office accommodation uncomfortable.
- they are saved from the stress and time of journey.
- when sick, no extra time is wasted in sick leaves.
- they can maintain a good balance with work and family.
- no extra work or assignments due in between office time.
- productivity decreased due to lack of office environment
- isolated.
- their work is out of sight and their contribution

goes unrecognised.

- must guard from working too many hours per day.
- cost of required equipments if not provided ~~at~~ by organisation, is expensive for the employee.

Advantages and disadvantages of teleworking for employers

- No sitting arrangement or workspace needs to be provided.
- improves morale and reduces turnover.
- continuity of work even when local or natural disasters occur or when a disease is viral.
- gain in productivity.
- decrease in organization's footprint.
- access of database anywhere poses security threats.
- emergency meetings → teleworkers can't be gathered instantly.
- work quality evaluation can't be monitored always.
- increased planning required to employ teleworkers.
- additional costs for equipments and devices of teleworkers.
- equipments lost or stolen.

Digital Divide

When people talk about standard of living, they are often referring to a level of material comfort measured by the goods, services and luxuries available to a person, group or nation — factors beyond the GDP bases measurement of standard of living. Some of the indicators include the following :-

- ① Average number of calories consumed per person per day
- ② Availability of clean drinking water.
- ③ Literacy rate
- ④ Availability of basic freedom
- ⑤ No. of people per doctor
- ⑥ Infant mortality rate
- ⑦ Crime rate
- ⑧ Rate of homeownership
- ⑨ Availability of educational opportunity.

Another indicator of standard of living is the availability of information and communications technology. The digital divide is a term used to describe the gulf between those who do and those who don't have access to modern information and communications technology such as cellphones, smartphones, PCs and the Internet.

High - low internet penetration by country within region

- Africa - Morocco - 51% - Ethiopia - 1%
- America - Falkland Island 96% - Belize - 23%
- Asia - South Korea 82% - Myanmar - 1%
- Europe - Monaco - 100% - Kosovo - 20%
- Oceania / Australia - Australia - 89% - Papua New Guinea - 2%

- If an individual is connected to a communication network → health
→ crime → other emergency situations

- Many info for career, retirement and other situations available by IT.
- IT helps in political, social and cultural situations
- Economic depression in Asia occurred in 1997 and it concerned many resulting to analysis of problems such as - cheap labour based work; globalisation required quality of products as well - which then made them realize the need of digitalisation in all sectors.

8/06/17

Mobile phone : the tool to bridge the digital divide

Cell phones have several advantages over personal computer :-

- ① Cell phone come in a wide range of capabilities and cost, but are cheaper than personal computers. Some users simply purchase a SIM card and then swap SIM cards in and out of a shared phone ~~call~~ to lower the costs even further.
- ② Cell phones are more portable and convenient than the smallest laptop computer.
- ③ Cell phones come with an extended battery life which makes the cell phone more reliable in regions where access to electricity is inadequate or non-existent.
- ④ There is almost no learning curve required to master the use of a cell phone
- ⑤ Basic cell phones require no costly or burdensome applications that must be loaded and updated.
- ⑥ ~~There~~ are essentially no technical support challenges to overcome when using a cellphone.

10/28/18

The impact of IT on healthcare costs:

- Electronic health records. $\Rightarrow \$88$ billion invest.
- ICD-10

An electronic health record (EHR) is a computer readable record of health related information of an individual.

All most countries have a standard EHR.

It provides benefits in office work and hospital work.

Such integration is planned at cross level.

It has been shown that in people who work

more than 40 hours per week, using the system increased the risk of developing heart disease.

However, it is not clear if this is due to the fact that people tend to follow a diet with less healthy food or because they are more stressed.

+5/06/17

Medical Information Websites for Lay people

12/06/17

* Goal is to support a transition of mobile and wireless technology in the healthcare industry :-

Common uses of wireless technology in the healthcare field:-

- ① Providing a means to access and update EHR at patients' bedside to insure accurate and current patient data.
- ② Enabling nurses to scan bar codes off patient wrist bands and onto medications to help them administer the right drug in the proper dosage at the correct time of the day.
- ③ Using wireless devices to communicate with healthcare employees wherever they may be.

Telehealth:
Telehealth employs electronic information processing and telecommunication to support at-a-distance health care, provide professional and patient-health related training and support healthcare administration.

Live Telemedicine:

Telemedicine is the component of telehealth that provides medical care to people at a location different from the health care providers. There are 3 basic forms of telemedicine -

① Store and forward

② Live telemedicine

③ Remote monitoring

Store and forward telemedicine:

Store and forward telemedicine involves acquiring data, sound, images and video from a patient and then transmitting everything to a medical specialist for later evaluation.

Live telemedicine:

Live telemedicine requires the presence of patients and healthcare providers at different sites at the same time and often involves a video conference link between the two sites.

Remote monitoring:

Remote monitoring involves the regular ongoing measurement of an individual's vital signs (temperature, blood pressure, heart rate and breathing rate) and other health measures and transmission of this data to a health care provider.

2.8 million people from 2012 started this remote monitoring system.

Medical Information Websites for lay people

- * Healthy people as well as those who suffer from illness need reliable information on a wide range of medical topics to learn more about healthcare services.
- * A tremendous amount of healthcare information is available via the web but lay people cannot become as informed as medical practitioners.
- * The websites have a critical responsibility to publish current, reliable and objective information.
- * The contents of a medical information websites such as text, graphics and images are for informational purposes.
- * The websites are not intended to be substitutes for professional medical advice, diagnosis or treatment.
- * Individuals should always seek the advice of a physician regarding a medical condition.
- * A patient should never disregard professional medical advice or delay seeking it because of something he or she reads on a medical information website.
- * In addition to publicly available information on the web many healthcare providers, employers and medical insurers offer online tools that go beyond basic health information.

- not alternative to doctor's advice
- provides info such as: hospital facility
 - : treatment availability
 - : cost details etc.
 - : required treatment etc.

to start for treatment go to the hospital in
the nearest town or city. If you have a medical
condition, you will need to see a doctor.
Waiting at the hospital can be a long time so it is
a good idea to make an appointment. You can do this
online or by phone. It is important to let the doctor know
about any medications you are taking, as well as any
other health conditions you may have. This will
help them to provide you with the best care possible.
If you are feeling unwell, it is important to seek medical
attention as soon as possible. If you are experiencing
any symptoms of a medical emergency, such as
difficulty breathing, chest pain, or loss of consciousness,
it is important to seek medical attention immediately.
In some cases, you may need to be admitted to hospital
for further treatment. In other cases, you may be able to
receive treatment on an outpatient basis. It is important
to follow the doctor's instructions and take all
medications as prescribed. If you have any questions
or concerns about your treatment, it is important to
ask the doctor or nurse. They will be happy to answer
any questions you may have and help you understand
your treatment plan. It is also important to attend all
scheduled appointments and follow the doctor's
instructions carefully. This will ensure that you
receive the best possible care and treatment.

Chapter - 5

Globalization and Human Rights

Globalization means:-

- ① Integration of countries through commerce, transfer of technology, exchange of information and culture.
- ② It includes acting together and interacting economies through trade, investment, loan, development schemes and capital across countries.
- ③ It also includes knowledge, science, technology, skills, cultures, information and entertainment besides direct human resource, telework and outsourcing.

This independence among the nations increased the complex tensions and ruptures among the nations.

For engineers, the issues such as multinational organisations, computer, internet functions and environmental ethics have assumed greater importance for their very sustenance and progress.

Multinational corporation:-

Organisation who have established business in more than one country are called multinational corporation. The head quarters are in the home country and the business is extended in many host countries. The Western organisations doing business in the less economically developed countries gain the advantage of

- (i) Inexpensive labor, start up cost
- (ii) Availability of natural resources
- (iii) Conducive tax atmosphere
- (iv) Virgin market for their products.

The developing countries are also benefited by

- ① Fresh job opportunities
- ② Jobs with higher remuneration and challenges

(ii) transfer of technology.

Social and cultural disturbances:-

- ① Loss of job for the home country
- ② Loss or exploitation of natural resources
- ③ Political instability for the host countries

Quiz 03

17/07/17

Chapter 4

8/07/17

What are the moral responsibilities and obligations of the multinational corporations operating in the host countries? Discuss with the framework of right ethics.

Common minimal rights are to be followed to smoothen the transactions when engineers and employees of MNCs have to interact at official, social, & economic and sometimes political levels. At internal levels, the organization are expected to adopt the minimum levels
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 conflict

Ten international human rights to be taken care of, in this context :-

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 minority is prevalent in the host country, the MNC will be compelled to accept. MNC 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 associations.
8. Right to have minimum education.
9. Right to political participation.
10. Right to live and exist (coexistence). The individual liberty and sanctity of the human life are to be respected by all society.

Technology transfer is an important part of globalization

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 applications from laboratory into 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. Factors such as economic, social and technological constraints are the causes of for the engineering constraints. Depending on the availability modification of technology. Depending on the availability of resources, physical conditions, capital opportunity costs and the human value system which includes their traditions, beliefs and religion, the appropriate is to be considered. determined.

MNCs and morality

The economic environmental conditions of the home and host countries may vary. But the national institutions 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 MNCs 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, besides cultures and promote culture of the host countries.
- ⑤ The multinational organizations should provide a fair remuneration to the employees of the host countries. If the remuneration is high as that of the host country, this may create tensions and if it is too low, it will lead to exploitation.

⑥ Multinational institution 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.

~~Quiz up to here~~

Bhopal Gas Tragedy

Example of MNC causing harm when a host country doesn't think of their own sustenance.

- In 1984, this occurred. 600 people died, 7000 injured, 2 million adversely affected.
Technologically, the tragedy was caused by a series of events listed:-

- i) MIC ~~the~~ tanks were filled upto 75% instead of the suggested 60%.
- ii) Safety policy ~~was~~ prescribed to have empty tanks in case of emergency, but these tanks were also filled upto capacity.
- iii) The tanks were supposed to be refrigerated. But the refrigeration system was off.
- iv) The plant was shut down 2 months ago before the accident and the workers were not trained well to clean the pipeline.
- v)

vi)

vii) Workers tried to spray water upto their capacity of 100 ft. but the fire spread higher than 100 ft.

viii)

The fire started at 10 am and it spread quickly and left the entire forest area burnt, and spraying the area with water did not help because the trees were suspended off the ground and most of the bark was eaten off from the trees which had been burning for many months. In addition to that, there were about 1000 ships holding onto the area which caused more damage. Now about 90% of the area affected after missing the first time, another bush fire took place due to different environmental factors and the second one was even worse than the first one. The second one was caused by the burning of the vegetation and the third one was caused by the burning of the trees.

(v)

20/07/17

Determinants of Human rights

- ① The level of democracy
- ② The level of economic development and its growth rate.
- ③ Population size and its growth ~~rate~~
- ④ The prevalence of a military or leftist regime
- ⑤ British cultural influence
- ⑥ Recent experience with international and civil war

Impact of globalisation on human rights.

Is there any policy to correct these violations?

1. VN

2. ICC

3. NGO

Supporting the legal framework
which leads to protection of children
from exploitation.

This has started in other countries like
Russia.

Helping children to be part of
the family.

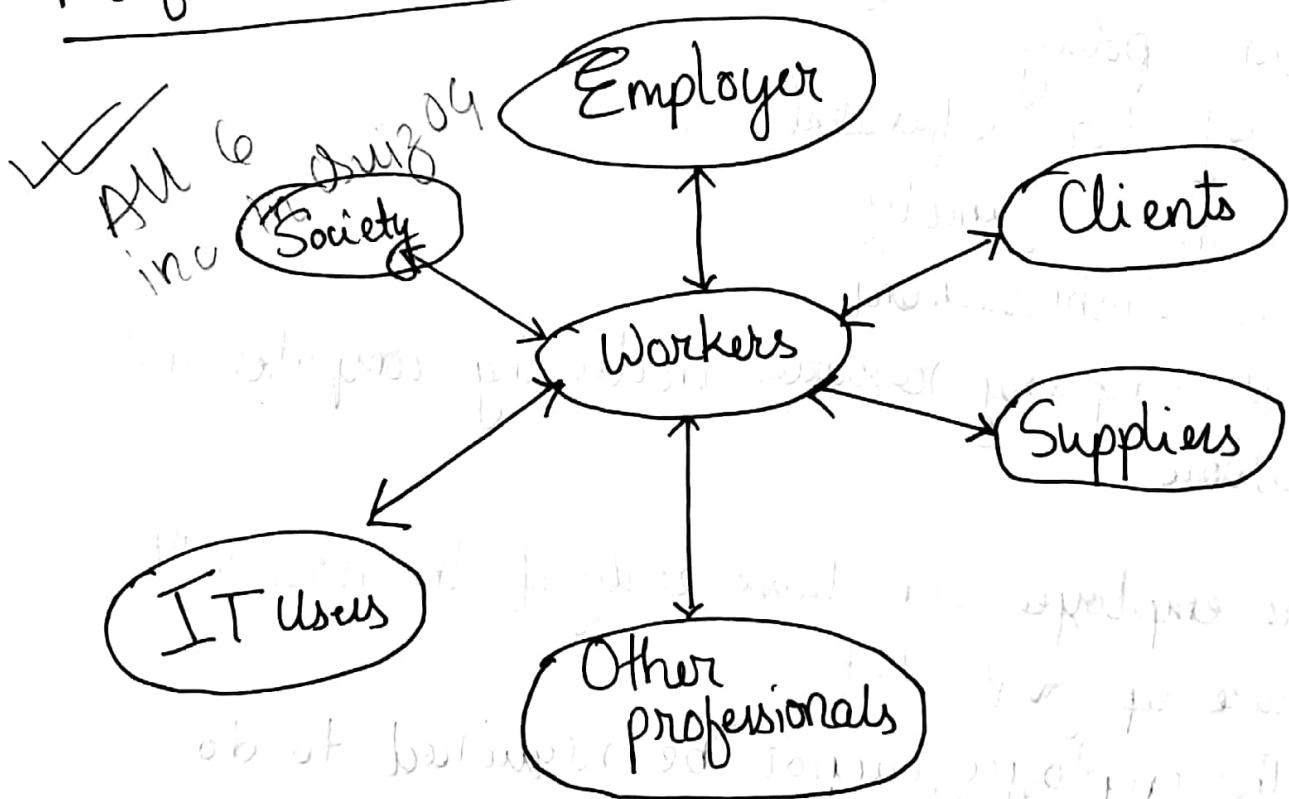
Chapter - 6

Ethics for IT Workers and its Users

IT Professionals: is a calling that requires specialized knowledge and often long and intensive academic preparation.

- IT workers are not professionals since they are not registered by federal governments.
- In all sectors, professionalism is not required

Professional relationships that must be managed:



Relationship between IT Workers and Employers:

- Both parties have to maintain relationship.
- Before accepting offer of employer, an employee should check:
 1. Job title
 2. General performance expectations
 3. Specific work responsibilities
 4. Drug testing requirements
 5. Dress code
 6. Location of employment
 7. Salary, work hours, company benefits

~~These fundamental~~ Some other factors to be checked before employment are:-

1. Protection of company secrets
2. Vacation policy
3. Time off for a funeral
4. Illness in the family
5. Tuition reimbursement
6. Use of company resources including computer and network

- The employee can leave early if the hours will make up for it later.
- The employee cannot be required to do anything illegal
- Some other relationships will be established based on the project involved, ~~based on~~ programming

The relationship between IT Workers and Clients

24/07/17

IT Workers provide services to clients - sometimes the clients are coworkers who are part of the same organizations as the IT workers.

The relationship between IT workers and suppliers:

IT workers deal with many different hardware, software and service providers. Most IT workers understand that building a good working relationship with suppliers encourages the flow of useful communication as well as the sharing of ideas. Such information can lead to innovative and cost effective ways of having using the supplier's products and services that the IT workers may never have considered.

The relationship between IT workers and other professionals

Professionals often feel a degree of loyalty to the other members of their profession. As a result they are often quick to help each other obtain new positions but slow to criticize each other in public.

A number of ethical problems can arise among members of the IT professional. One of the

most common is resume inflation.

The relationship between IT workers and IT User

The term IT user refers to a person who uses a hardware or software product, the term distinguishes end user from IT workers who develop, install, service and support the product.

IT workers have a duty to understand a user's needs and capabilities to deliver products and services that best meet those needs - subject, budget and time constraints. IT workers have a key responsibility to establish an environment that supports ethical behaviour by users. Such an environment discourages software piracy, minimize the inappropriate use of corporate computing resources and avoids the inappropriate sharing of information.

The relationship between IT workers and society

- maintain laws and standard of society.

- protect public from potential risk.

- maintain two most important personal relationships.

- to society no. to do with social strategies.

Computer Ethics:-

27/07/17

Computer ethics is defined as :-

- a) Study and analysis of natural 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, a systems managers and operators. 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.

- ① - uses of computer replaces job position.
 - overcome by reassigning workers and training them.
- ② by breaking privacy and accessing individual data
 - ⇒ erase data and change ownership
- ③ withdrawing money from bank account by fraud
- ④ computer has the object of an unethical act.

Hacking

- software stolen or information accessed from other computer resulting in privacy hamper and loss in business
- privacy of nations hampered.

Spamming

- spreading virus : "Trojan horses"
- if virus enters a computer, it can destroy images and files beyond recovery → mental torture / financial loss
- Backers justify their right to information or do it for fun, however it is unethical.

Problems related to the automated nature of computer

Security risk

Eg: Tokyo stock exchange recently a share of L A junior trader; 6 lac Yen was supposed to be sold but mistakenly it was sold for rate of 61 Yen.

- Only few buyers agreed to reverse the deal.
- Loss of finance and reputation
- High tech couldn't solve this problem.

Loss of lives

- Suicide as a result of cyberbullying
- automated defense system \Rightarrow if error in hardware or software, may detonate weapons at wrong place or time.

Computer in Workplace

- poor sitting design \Rightarrow Wrist pain and back pain
- Electromagnetic radiation \Rightarrow harms ~~are~~ especially health and safety of ^{especially} women and pregnant women.

Property Issue

- Anonymous phone call to scam people.
 - Violation of property rights (~~software~~)
 \Rightarrow and patent rights (hardware)
and copyright (software)
- CD and DVD companies suffer most from piracy, i.e. copying without permission.

Justified by saying that materials are expensive
but it is ethically wrong.

Facebook, Freedom of Speech, Defamation and Cyberbullying

Defaming - harming image and reputation

Cyberbullying - using texts and communication threatening.

CDA - Communication Defense Act
Decency

[website owners are not liable for content posted by third party.]

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Chapter - 47

Population and Environmental Ethics

Demography: The study of population

1200 years ago - population = 5 million

" " = 6.9

2010 Now -

- Statistics as well as how to control it.

Basic concepts of demography:

1. Fertility

Crude Birth Rate (CBR) = $\frac{B \times K}{P}$

2. Mortality

Crude death rate (CDR) = $\frac{D \times K}{P}$

3. Migration.

Infant mortality rate

(IMR) = $\frac{D \text{ (below 1 year)}}{B \times K}$

Migration

B - Birth
 D - Death
 P - Population
 K - 1000

Immigration Out migration

Difference between the two (Net migration)

Migration - movement from one territory to other

International Internal
 (country to country) (urban to rural)

History of world population growth

1800 - 1 billion

1930 - 2 billion

1962 - 3 billion

1974 - 4 billion

1987 (- 5 billion)

1999 - 6 billion

2010 - 6.9 billion

Currently the world is gaining 83 million people each year. 97% of this increase is in poor countries. Experts predict that earth's population is now more than 7 billion and very soon it will climb more slowly to 9 billion by 2050.

Rate of increase in population in

Bangladesh $\rightarrow 1.20\%$

Population density of Bangladesh $\rightarrow 1100$

Japan $\rightarrow 346$

Malthusian Theory

Demographic Transition Theory

↳ malthusian, abiding, replacement subum ②
population boom because ③

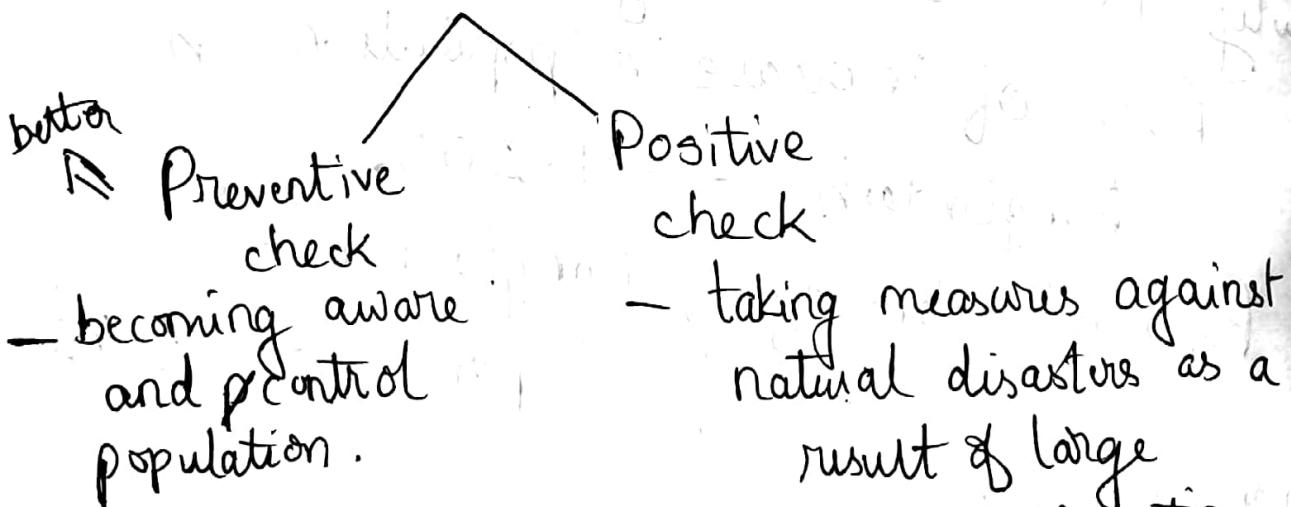
①

②

31/07/

Malthusian Theory

Thomas Robert Malthus, an English economist and clergymen warned that population increase would soon lead to social chaos. Malthus calculated that population would increase in a geometric progression illustrated by the series of numbers (2, 4, 8, 16, 32) and so on. Food production would also increase in an arithmetic progression (2, 4, 6, 8, 10) because even with new agricultural technology, farmland is limited. Thus Malthus presented a distressing view of the future people reproducing beyond what the planet could feed, leading ultimately to widespread starvation and war over what resources were left.



This theory was later proved wrong : -

①

② Modern irrigation, pesticides, agriculture \Rightarrow increased food hugely

How does Marx criticise Malthus?

Malthus — overpopulation is a problem
Marx — food production is not a problem, rather the problem is inequality in the capitalistic social structure. Nature has the capacity to feed everyone.

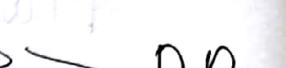
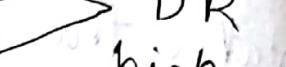
↳ Capitalists — Joint labour - Joint profit
↳ possessive, own
↳ looking to increase, profit only.

Using Despite high technology, natural resources are used thus as a result the natural resources are pressurised. Thus, it is not wise to not control population.

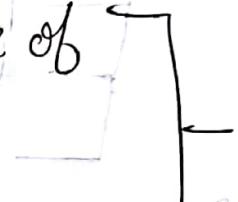
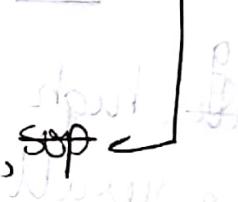
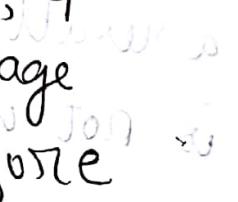
Demographic Transition Theory:

Demographic transition theory links population changes to a society's level of technological development.

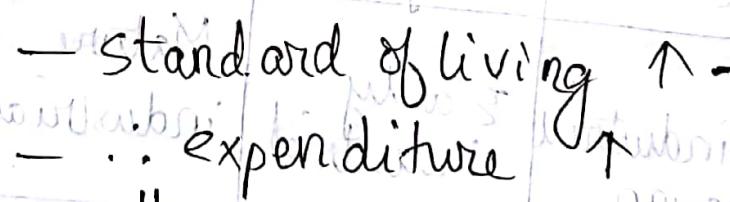
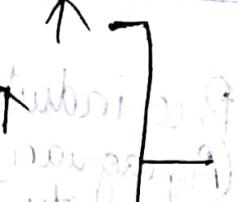
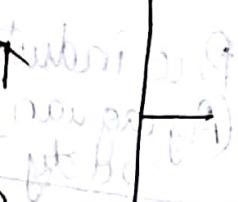
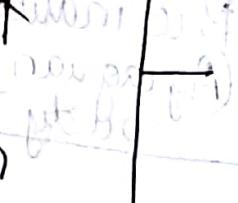
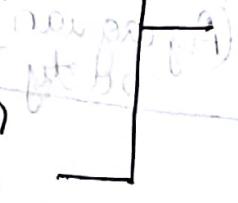
	Stage - 1	Stage - 2	Stage - 3	Stage - 4
Level of technology	Pre industrial (Agrarian society)	Early industrial	Mature industrial	Post industrial
Population	Very slow	Rapid	Slowing down, with fluctuations	Very slow

Pre industrial - economic value of children (asset) 
 - no control over birth rate 
 - modern treatment facilities 
 - diseases not controlled 

~~BR didn't ↓ → first were from death is looked for social understanding~~

Early industrial - modern / advanced treatments, thus people didn't die of all diseases  DR ↓
 - food supply ↑ 
 - food not reserved, so prevented from wastage 
 - BR high as before
 :: Rapid population growth (time of Malthus' theory)

Mature industrial - huge employment opportunities (M & F)

- food 
 - standard of living ↑ 
 - expenditure ↑ 
 - children became an economic liability 
 - Thus, population ↓ 

Technology and environmental deficit:-

Sociologists point to a simple formula $I = PAT$
where

I = Environmental impact

P = Society's population size

A = Society's ~~population~~ ^{level} of affluence

T = Society's level of technology

- First intermediate society began impacting society gradually, but not much since they were muscle power based and animal power based
- After industrial revolution, engines and machines began using resources of natural and thus also ~~n environment~~ polluting environment.
- $\approx 23\%$ people are using 50% of the world's resources. Short term benefit caused long term harm. This was realised after a century.
- Sustainable measures need to be adopted

Environmental Ethics:

One of the most important political issues of the late 20th and early 21st centuries has been environmental protection and the rise of environmental movement.

This movement has sought to —

- ① Control the introduction of toxic and unnatural substances into the environment.
- ② to protect the integrity of the biosphere.
- ③ to ensure a healthy environment for humans.

Engineers are responsible in part for the creation of the technology that has led to damage of the environment and are also working to find solutions to the problems caused by modern technology. The environmental movement has led to an increased awareness among engineers that they have a responsibility to use their knowledge and skills to help protect the environment.

An engineer's responsibility for the environment is denoted with phrases such as "sustainable design" or "green engineering." These concepts incorporate ideas about:-

- ① ensuring that our design do not harm the environment
- ② by using sustainable design principles engineers will help to maintain the integrity of the environment and ensure that our quality of life can be sustained.
- ③ sustainable design includes not only ensuring that a product has minimal environmental impact during its use, but also that it can be manufactured and disposed of without harming the natural environment.

• Sustainable design can be categorized into three main types:
1) Sustainable products: These are designed to be used and disposed of in a way that minimizes their impact on the environment. This can be achieved through the use of renewable materials, energy-efficient designs, and recyclable packaging. Sustainable products often have a longer lifespan than traditional ones, which reduces waste and conserves resources.

10/08/17

There are multiple approaches for solution of environmental problems:-

- ① Cost-oblivious approach
- ② Cost-benefit approach

(Self study)

Question

7 Ques from 7 Chapter (a, b, c) - 14 each
Answer any 5. in order of a, b, c