

Human Values

Topics;

Morals, values and Ethics - Integrity - Work Ethics - Service learning - Civic virtue - Respect for others - living peacefully - Caring - Sharing - honesty - courage - value time - co-operation - Commitment - empathy - self confidence - spirituality - Character.

Morals, values and Ethics

Ethics:-

Definition: Ethics involves the displain that examines good or bad practices with in the Context of moral duty.

business ethics: Business ethics include behaviour and practices that are good or bad

There are 3 types of Ethics

1) Descriptive ethics 2) Normative ethics 3) Applied ethics

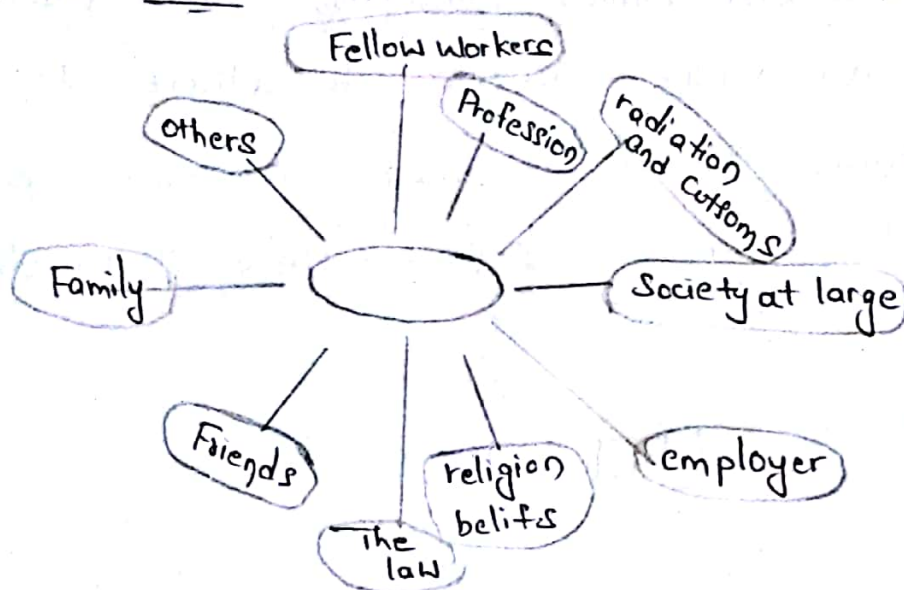
1) Descriptive ethics: Involves discribing the characterising and studying morality "What is"

2) Normative ethics: Involves suppling and Justifying moral systems "What should be"

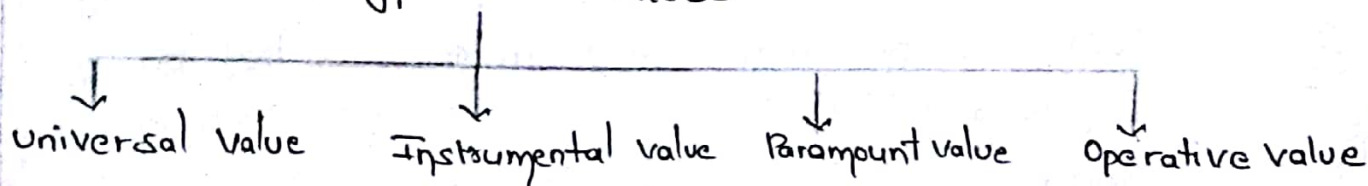
3) Applied ethics: Moral out come can be achieve a specific situation "About How"

Moral value: Values are the criteria for determining good or bad fair and unfair, just and unjust.

Many Sources of value:



There are 4 types of values



- 1) Universal value: It has the same value or almost all people know
- 2) Instrumental value: These are the values that can be used to get something else
- 3) Paramount value: which is above all the other things
- 4) Operative value: We may Judgements on how to live the rest of other lives.

Sources of moral values:

Religion:	Science:	Culture:	Law
Teaches how to behave Eg: Sikhs covers their head and bear	To proof certain facts, phenomenons What is right and wrong	Values, rules Standarded transmitting among generations	Rules and Regulations guided the human being

Importance of values; www.FirstRanker.com

www.FirstRanker.com

- 1) Personal values; Every one knows the life is precious the life is important we all protect our life because we care for it. more than anything else.
- 2) Character Molding; children do what as they develop their own senses of right or wrong
- 3) other personal values; honesty, respect, Bravery, Courage, affection, patience, responsibility, Justice, Truthfulness, beauty.

Integrity

Definition: The quality of being honest and having strong moral principles.

1. loose your wealth and you have lost nothing
2. loose your health and you have lost something
3. loose your integrity and you have lost everything

Meaning:

1. Integrity is the inner voice that wants somebody is looking
2. Don't compromise your self it's all you have bought.
3. Stand up for what is right even if your standing alone.

Integrity has '5' Principles :
(about how you)

1. life $\begin{cases} \rightarrow \text{Blame less life} \\ \rightarrow \text{Righteous life} \end{cases}$
2. Talks $\begin{cases} \rightarrow \text{Speak truth from heart} \\ \rightarrow \text{honorably} \end{cases}$
3. Treat others $\begin{cases} \rightarrow \text{fairly} \\ \rightarrow \text{Respectably} \end{cases}$
4. Evil end to good $\longrightarrow$ promiceess
5. Finances $\longrightarrow$ honesty people

Seven Purposes;

1. Doing what we say we will do
2. Talking Responsibilities
3. Talking care of ourselves
4. Thinking of a big picture
5. Respecting others
6. Checking the Mirror
7. Stand up for what is right and what is wrong.

Work Ethics

1. Ethics is a collection of values and behaviour
2. Ethics is a good behaviour
3. Positive work ethics is the collection of all the values and actions that people feel appropriate in work place.

Performance Standard;

- 1) Punctuality 2) Attendance 3) Good occupational skills

4) Character → honesty
→ Commitment
→ loyalty (Salary)

5) Employee must be Company Secreates.

Honesty :- 1. Never lie on your application
2. time sheet

Trust worthyness :- Higher Trust is equal to higher payment

Trust worthyness is equal to dependability and reliability

* Initiative ; 1. Motivated
2. Enthusiastic
3. Self displain and self responsibility
4. Team work

* Appearance ; Neat and clean smell.

* Manarism ; Attitude positive attitude
Appear self confidence

Service Learning

Service learning refers to learning the Service polacies, Norms, processions and conditions other than the technical trade practices.

The Service learning Includes the characteristics of British basic requirement, security of job and awariness of the procedures, while taking decisions and actions.

Services learning helps :-

1) colleges 2) Community 3) Business 4) partnerships

5) Engineers.

Importance :-

Why to Service learning ?

→ Because it

→ Promotes numerous Skills

- i, problem Analysis
- ii, Critical thinking
- iii, logical reasoning
- iv, detail observation
- v, issue identification

Ethance ;

- i, Student motivation to learn
- ii, Student retention.
- iii, Improves student learning outcomes
- iv, Encourages
- v, Sustainability

Importance ;

- * Service learning is non paid activities in which Service is provided on voluntary bases
- * Non Profitable Institutions and charitable organisations
- * Service learning Combines Community Service with class room instruction , focusing on critical and reflective thinking as well as personal and civic responsibility.
- * It engages students in the education process using what they learn in the class room to solve real life problems

* The partnership built between Community Students and faculty (or) reciprocal meaning shared responsibility and gain helping students, address local needs, while developing their academic skills and commitment to their Community.

SWOT : Strength, weakness, opportunity, threat.

Civic Virtue

Civic means civilised living in a city virtue means moral, good

Civic virtue morality or a standard of rightness behaviour in relationship to a citizen involvement in Society.

1. Integrity 2. honesty 3. fairness 4. Voting 5. Acceptancy
6. open mindedness 7. Selflessness 8. Courage.

Meaning :-

* Civic Virtue is the behaviour of good citizen it includes

1. Voting 2. obeying 3. rules and regulations 4. Serving of
- injuries 5. responsibility

* Civic Virtue involves giving back to your community, and your society some of what they have received.

* It is the cultivation of habit of personal living that are claimed to be important for the success of the Community

Civic Virtue is also the dedication of citizens to the

Common welfare of their Community even at the cost of their individual interest.

* A modern example of civic virtue is "Mother Teresa"

1. Catholic Sister
2. Established many Missionaries of Charity all over the world.
3. helped the poor the abused AIDS victims.

* Mother Teresa wrote one letter

1. Explain how Mother Teresa sees the face of Jesus in others.
2. Urged assisting the poor.
3. Encourage the mission works in the United States.

* How does civic virtue function in a democratic Society?

1. In a democratic Society we are able to support the less fortunate with welfare programmes and private charities.
2. Peoples also receive tax deduction for donation to charities.
3. Help citizens of a Society understand their role in the whole picture of the Society.

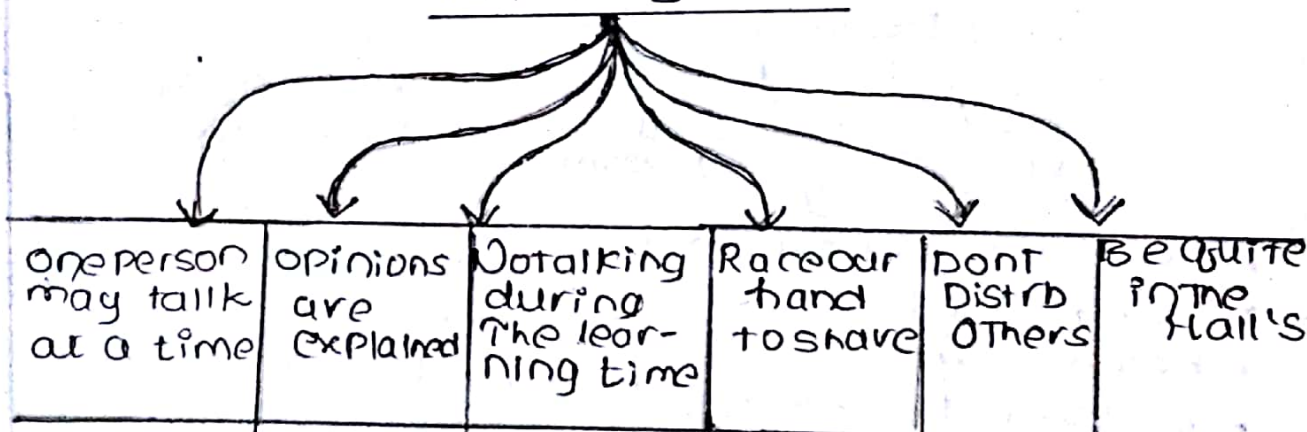
1. Responsibility : The able to choose for one selves between right and wrong the ability to answer for one's conduct and obligations.
2. Integrity : Always do right things this will gratify some and Astonish the rest.
3. Respect :- Since we all want to be respected it motivates us to acting a manner that will Command the rest of others.
4. Courage :- Mental or Moral strength to venture, pressure and with standered danger fear and difficulty.
5. Initiative :- Independent of outside influence or control ; Introductory Step.

* Respect for other's :

Give Respect → take Respect I Respect → you Respect

- R - Respecting - we are Responsible
- E - Educating - we are aquired for Success.
- S - Supporting - we stay free (safe)
- P - Person - we pride in our selves and our School
- E - Expectations - we treat everyone equal
- C - Choicess - we communicate Polietly
- T - Team in Trust - we try our best

: Respecting others:



Defination: Showing high regard for self other's and property

What is Respect : Thoughtfulness - a feeling of Honour, wishes, rights, traditions are belong of other's.

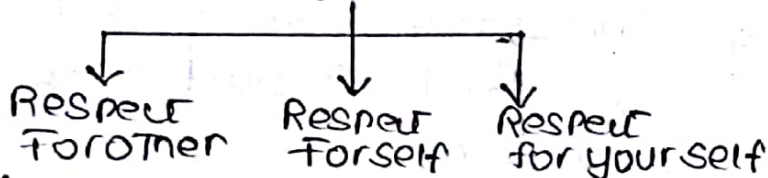
Respect Golden and Rule : Treating other's the way you would want to be treated.

Ex 1 : show Respect by asking permission before using some one else things

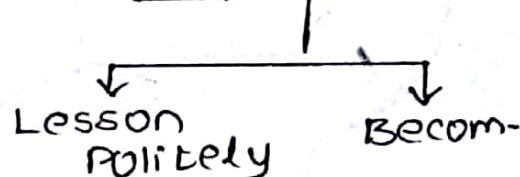
Ex 2 : show respect of other's even when they are different from you.

Request quote:

- (i) Respect is loud in plain clothes
- (ii) when you are contain to be simply when respect you
- (iii) Courtesy is the shortest distance b/w two people
(Rules & regulations)

3 R's

- (i) before respecting other's - we must first respect our self
- (ii) show respect to yourself by accepting honouring your own
- (iii) Amotations, skills, belires, ability challenge

Respect for others

- Dressing appropriating
- Standing up of your own belif's
- helping and caring for other's
- Be kind to other's by not teasing making fun off

* Leaving peacefully

- (i) Peace is the inner Silence filled with the power of truth. Peace consists of Pure thoughts, pure feeling and pure wishes.
- (ii) Happiness does not carry a price tag the richness of our life depends upon the quality of our concences and activities.
 - Don't interfere other bussiness unless ask.
 - Forget and forgive.

Love flourishes in giving and forgiving
Ex: Stomachache, Headache, Mental Stress etc,

- Do not crave for the recognition.

This world is full of selfish people

- Don't feel galled.
- Change ourself.
- Endure what cannot be cured.

Everyone and everyday we face numerous accidents and that are beyond our control. We must learn to endure them cheerfully

- Make regular prayer
- Never leave the mind vacant.
- Don't procrastinate and never regrade.
- Don't waste time enough because we can never fully anticipate all future happenings
- Never regrade what ever happened was
- Don't bite off more than we can chew.

* Caring:

- Caring is feeling for others
- Caring is reflected in activities such as Friendship membership and social class, & profit?

- Caring does not cost anything

- A good quality of caring requires

* giving trust

* Teaching and training

* Researching

* Fearless to practice

* Working with others

* Working in teams

* All counsellors, psychotherapists, trainers and supervisors are required to have regular

The very idea of the Profit state claims on the ethical ways of knowledge and skills especially health Medicines, nursing, delivery services that mean.

* Sharing:

- Sharing means sharing of feeling ideas and thoughts resources and profits sharing is always mutually beneficial sharing is morally acceptable feeling, resources and Materials is a value
- Sharing is one of the human values this implies joy increases happiness of people involve similarly sharing of people involve, similarly sharing sorrow decrease the intensity of mental agony of people.
- In Industries, corporations, people of different categories like the managing director, Engineer's Doughnuts, Supervisors and workers have to play their role on sharing bases
- Sharing is so important to a man's moral
- Sharing of property (or) materials of comfort with relatives, Guests and coworkers hosts the human values.
- For the humanity 'Sharing is a culture.
- Sharing not only paves the way to prosperity early and easily, and sustains it.
- Economically speaking, benefits are maximized as there is no wastage.
- Technologically, the productivity and utilization are maximized by sharing.

* Honesty:

Honesty is a quality of being truthful and able to be trusted

If some one places are put their trust on you. They believe that you are honest and reliable. That is we will do the right things.

Meaning:

Honesty is the written to make effective change and identifying who you really what we really want.

• What is it?

- Speaking and acting in accordance with with the truth keeping every promise we make

• What is the result? - Integrity.

Non verbal Description:

- Less smiling
- Blinking
- never's self touch.

Some times easy to lie:

- * to get out of trouble
- * to look good to others
- * To avoid the facility our failure
- * To protect some body is feeling

How I cultivate it?

- Be honest with yourself, Admit past
- failures in honesty
- Choose good friend's
- Use good communicational skills.

* Courage:

meaning: putting your selves at risk for some higher purpose

physical courage : moral courage : courage to continue.
courage to attempt something big. courage to commit a person possesses two types of courages

1. physical courage
2. mental or moral.

physical courage:

1. physical courage encourages the man to do work of risk like manufacturing rockets, launching satellites.

ex: mahatma gandhi, Jawaharlal nehru, Subhash chandra Bose

2. physical courage saves life reaches a nobel cause, gain respect.

moral courage:

achieve justice, reform, self respect.

courage to continue:

successful completion, respect of others.

courage to attempt something big:

note worthy achievement, respect of others.

* courage to enables one to face danger, fear, difficulty with confidence and bravery is known as courage.

* courage does not mean the absence of fear.

How do I cultivate it (Courage):

1. Read the story books of courageous people.

2. project your selves into their situation what would I have done.

3. think about that kinds you have been courageous.
4. courage is quality you want to be exhibited.
5. be ready for the life changing moment when your courage is tested.

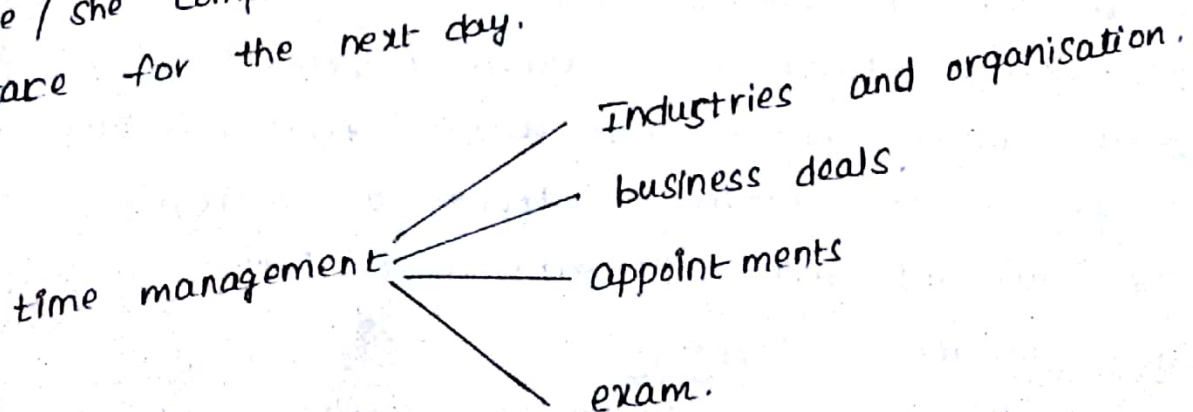
* Value of time:

The amount of time in a day is constant is 24 hours. Since the available time is fixed. It has not possible to have more than 24 hours in a day. one has to utilise the time usually by planing it wisely. time lost cannot be regained if one wants to come up in life and succeeded he (or) she has to be good in "time management person". good time management offers more time for other fruitful activities like fun, relaxation and serving to others.

* time is gold.

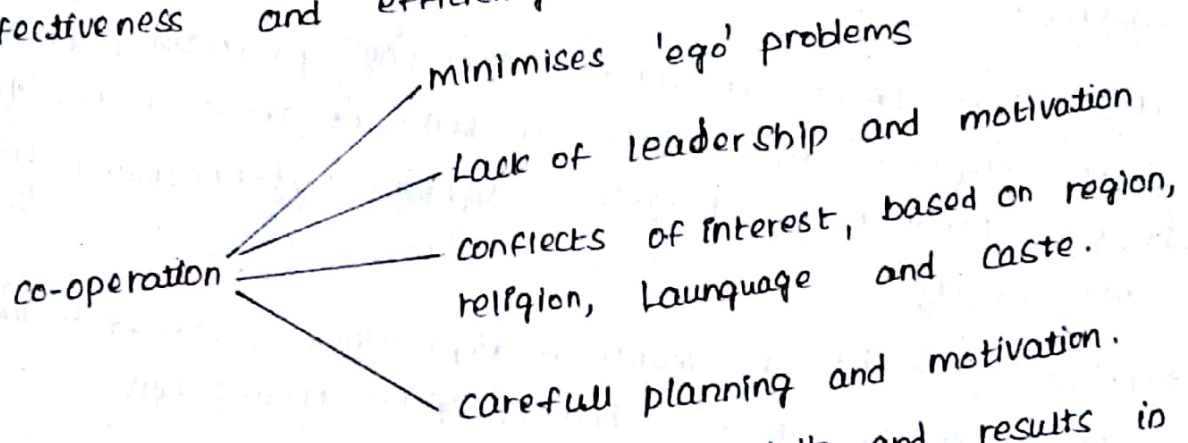
* time and tide wait for none.

one will have to keep a cheque on his (or) her days work. at the end of the day one has to cheque whether he / she completed that days work (or) something is left to take for the next day.



* Co-operation:

- * Co-operation between two persons. * working together ensures.
- * working coherence that is blending of different skills required to words a common goals.
- * It helps in minimising input resources (including time).
- * maximise the output which includes quality, quantity and effectiveness and efficiency.



- * Team work it develops the team spirit and results in team work.

- * Co-operation may be extended to others by giving a good idea and a good suggestion.

- * The absence of Co-operation leads to lack of communication, misinformation, void in communication, and undue delay between supply, production, marketing, and consumption. This is likely to demoralize and frustrate the employees, leading to collapse of the industry over time and an economic loss to the society.

* Commitment:

- When our value system is clear it becomes easier to make decisions and commitment.

1. ex: one can not make a commitment to his/her country by selling secrets to other country.

2. ex: friends.

* Commitment means alignment to goals and adherence to ethical principles during the activities. First of all, one must believe in one's action performed and expected end results (confidence).

* This is a basic requirement for any profession. For example a design engineer shall exhibit a sense of commitment, to make his product or project designed a beneficial contribution to the society.

Unkept commitments: It leads to depressions, Loss of business, high stress level, broken homes, poor relationships.

* Between parent and child, student and teacher, wife and husband, employer and employee things will work only when they committed to each other. Our strongest relationships are tied with commitment.

* Commitment implies i) caring, ii) dependability, iii) absence of duty, iv) sincerity v) character vi) Integrity.

* Empathy:-

- ① Sensing what others feel about, without their open talk, is the absence of Empathy.
- ② It includes the imaginative projection into others feelings and understanding of others background such as physical and mental state, economic situation and association.
- ③ A leader must have or develop in him the following characteristics
 - (a) Understanding others:- It means sensing others feelings and perspectives, and taking active interest in their welfare
 - (b) Service orientation:- It is anticipation, recognition and meeting the needs of the clients or customers.
 - (c) Developing others:- This means identification of their needs and bolstering their abilities. In developing others, the one should inculcate in him the 'listening skill' first.

Communication = 22% reading and writing +
23% speaking +
55% listening

One should get the feed back, acknowledge the strengths and accomplishments, and then coach the individual, by informing about what was wrong, and giving correct feed back and positive expectation of the subject's abilities and the resulting performance.

(d) Leveraging diversity (opportunities through diverse people):- This leads to enhanced organizational learning, flexibility and profitability.

(e) Political awareness:- It is the ability to read political and social currents in an organization.

The benefits of empathy include:-

- ① Good customer relations (in sales and service, in partnering)
- ② Harmonious labor relations (in manufacturing).

*Self Confidence:-

① It is an individual to have positive views about himself.

② Certainty in one's own capabilities, values and goals is self confidence.

③ Self confidence is a person develops a sense of partnership, respect and accountability and this helps the organization to obtain maximum ideas and the efforts, guidance from its employees.

Characteristics:-

- ① A self assured standing
- ② Willing to listen, learn from others and adopt

③ Frank to speak the truth

④ Heredity and family environment

⑤ Friendship

⑥ Superiors

⑦ Training in the organization.

Development of Self Confidence:- Many factors effect

the development of self confidence, parents attitude towards the children in their early years, play a critical role in this aspect. If parents encourages children moves towards self reliance and love their children when they make mistakes, children will develop self-confidence.

Friends influence also powerful in shaping one's Self confidence.

Methodologies will develop Self Confidence :-

- ① Encouraging 'SWOT' Analysis
- ② Training to evaluate risk and face them
- ③ Self talk :- It is conditioning the mind for preparing the self to act, without any doubt on his capabilities. This make one accepts himself while still striving for improvement.
- ④ Study and group discussion, on the history of leaders and innovators

* Spirituality :-

① Spirituality is a way of living that emphasize the constant awareness and recognition of the spiritual dimension (mind and its development) of nature and people with a dynamic balance between material development and spiritual development.

② It is said to be great virtue of Indian philosophy and for Indians.

- ③ It is a faith or belief in supernatural power (or) God regarding the worldly events.
- ④ It includes creativity, communication, recognition of the individual as human being.
- ⑤ We become God fearing and believe that he is the creator, care taker and destroyer of this universe.
- ⑥ All religions recognise and value a "Spiritual Approach" to realize God and obey the divine commands about good and bad things.
- ⑦ Religion is that of doing an "Spirituality" is a state of being.
- ⑧ Spirituality includes respect to others, acceptance, vision not believing anybody blindly and partnership.
- ⑨ Spirituality is the motivation, as it encourages the colleagues to perform better.
- ⑩ Spirituality is also gives energy.
- ⑪ Be energetic and flexible to adopt, to challenging and to changing situations.

* Character :-

- ① The character is exhibited through conduct.
- ② Character is the expression of the personality of a human being and that it reveals itself in one's conduct.
- ③ Every human being has a character.

④ Character is determined by the expectations of society.

⑤ Character includes attitude that determined a person moral and ethical actions and responsibilities. People are divided into several categories, according to common tendencies, ruthless, aggressiveness, ambition, selfishness and cheerfulness. Those whose lives are determined and directed by the prevailing habits, fashions, beliefs, attitudes, opinions, values of the society.

Types of Character:-

- ① The Intellectual Character
- ② The Emotional Character
- ③ The Volent Character
- ④ The Energetic Character

Character less:-

- ① The Sensitive
- ② The Active
- ③ The Apathetic (dull)
- ④ The Intelligent

Ethics and Character:-

* Ethics consider the relative of such types and the virtue of which constitute them. A man of character is frequently equivalent to being capable of adhering to a fixed purpose.

* Another essential is the virtue of justice, the recognition of rights, duties and playing as others.

Education and character:-

Education is not only the cultivation of intellect but also the formation of moral character

Building character in the work place:-

* Employee hiring, Training and Promotional activities

* Internal communication

* External communication

* Financial and human resources

Engineering Ethics

Topics :-

The History of Ethics - purposes for Engineering Ethics - Engineering Ethics - Consensus and Controversy - professional and professionalism - professional Roles to be played by an Engineer - Self Interest, customs and Religion - uses of Ethical Theories - professional Ethics - Types of Inquiry - Engineering and Ethics - Kohlberg's Theory - Gilligan's Argument - Heinz's Dilemma.

The History of Ethics :-

- * Engineering Ethics is a study of related question above the moral idea, character, policies and relationships between the people and corporations involved in technical Activities.
- * Engineer makes products that are manufacture and methods that satisfied basic needs, food and shelter help.
- * Scientist and Engineers makes discoveries and inventions as a result they construct projects and make products which are used by the people in their day to day life. This improves the standard of living of the people.
- * This improves the standard of living of the people.

Ex :- On July 28th 1986, The space shuttle Challenger failed and it was a total disaster.

Purpose of Engineering Ethics :-

- * Engineering Ethics is the activity and discipline and aimed at understanding the moral values.
- * Reserving moral values in Engineering.
- * Justifying the moral judgements in Engineering it deals with set of moral problems and issues connected with Engineering.
- * Engineering Ethics is defined by the Code and Standards of Conduct endorsed by Engineering Society with respect to the particular set of benefits, attitudes and habits displayed by the Individual (or) group.

Two approaches $\begin{cases} \text{micro} \\ \text{macro} \end{cases}$

Micro	Macro
It deals with decisions and problems of Individuals, professionals and companies deals with the societal problems.	Knowing moral values, finding accurate solution to moral problems and justifying moral judgements.

VARIETY OF MORAL ISSUES

It would be relevant to know why and how do moral issues (problems) arise in a profession or why do people behave unethically? The reasons for people including the employer and employees, behaving unethically may be classified into three categories:

1. Resource crunch

Due to pressure, through time limits, availability of money or budgetary constraints, and technology decay or obsolescence. Pressure from the government to complete the project in time (eg, before the elections), reduction in the budget because of sudden war or natural calamity (eg, Tsunami) and obsolescence due to technology innovation by the competitor lead to manipulation and unsafe and unethical execution of projects.

Involving individuals in the development of goals and values and developing policies that allow for individual diversity, dissent and input to decision-making will prevent unethical results.

2. Opportunity

- a) Double standards or behaviour of the employers towards the employees and the public. The unethical behaviors of World com (in USA), Enron (in USA as well as India) executives in 2002 resulted in bankruptcy for those companies.
- b) Management projection their own interest more than that of their employees. Some organizations over-emphasize short-term gains and results at the expense of themselves and others.
- c) Emphasis on results and gains at the expense of the employees, and
- d) Management by objectives, without focus on empowerment and improvement of the infrastructure.

This is the best encountered by developing policies that allow 'conscience keepers' and whistle blowers and appointing ombudsman, who can work confidentially with power to solve the unethical problems internally.

3. Attitude

Poor attitude of the employees set in due to

- a) Low morale of the employees because of classification

and downsizing.

- b) Absence of grievance redressal mechanism,
- c) Lack of promotion or career development policies or denied promotions,
- d) Lack of transparency,
- e) Absence of recognition and reward system, and
- f) poor working environments.

Giving ethics training for all, recognizing ethical conduct in work place, including ethics in performance appraisal, and encouraging open discussion on ethical issues, are some of the directions to promote positive attitudes among the employees.

To get firm and positive effect, ethical standards must be set and adopted by the senior management with input from all personnel.

Engineering Ethics :-

Engineering ethics is a means to increase the ability of concerned engineers, managers, citizens and others to responsibly confront moral issues raised by technological activities. Engineering ethics covers a range of factors that impact upon the process of decision making by individual engineers as well as the actions of their institutions. The subject of accountability and public duties of engineers is regularly monitored.

Focused training, periodic checking and monitoring, re-engineering the process and safety audit are some of the measures that can improve the competencies of an engineer to handle the given responsibilities in a competent manner.

Every one by virtue of position as a boss, supervisor, manager, director earns a share in the responsibility and also shares both obligations and blame.

Engineers are responsible for their professional conduct and the resulting outcomes. According to professional standards, they fulfill their tasks as they correspond to their competencies and qualifications. Engineers perform these tasks and actions carrying both individual and shared responsibilities.

Engineers should know the relevant law and regulations of their respective countries. They are committed to applying them in their professional environment. Engineers are committed to developing sensible technology and technical solutions. They accept responsibility for quality, reliability, and safety of new technical products and processes.

Engineering is the professional art of applying science to the optimum conversion of the resources of nature to benefit man. professional practice involves extensive training in the application of that knowledge. Engineering is an art requiring the judgement necessary to adapt knowledge to practical purposes, the imagination to conceive original solutions to problems, and the ability to predict performance and cost of new devices or processes.

One of the challenges for the engineers is to solve the problems as they arise, satisfying the conflicting requirements. All such activities involve vital decisions being taken by engineers at all stages of their planning, design, construction, operation, refurbishment and ultimately their decommissioning.

Engineering ethics covers a range of factors that impact upon the process of decision making by individual engineers as well as the actions of their institutions. Clear failures by engineers are seen in the forged testing documentation spent for nuclear fuel rods, the spectacular chemical process disasters of Bhopal Gas Tragedy etc.

If an engineer acts even though he is aware of the likely harm, ignores of the consequences and fails to exercise due and diligent care, then this is treated as dereliction of duty. This kind of behaviour is totally untalled for from any engineering professional. Ego-centric tendencies, microscopic vision, uncritical acceptance of authority, group think, coming to agreement without questioning are some of the impediments of responsible actions.

CONSENSUS AND CONTROVERSY

In the study of moral autonomy, consensus and controversy are relevant factors to discuss on. Consensus means agreement and controversy means conflict or disagreement.

In exercising moral autonomy, one is not likely to obtain the same results as by others. This situation is likely to end in a controversy. In this case, good amount of tolerance among the individual who are autonomous, reasonable and responsible is necessary. This does not mean forcing the engineer to reach unique moral solutions. Many reasonable solutions are possible to a given ethical problem. The ethics make the engineers realize the importance of tolerance among them, in case of disagreement while applying moral autonomy.

Professional and professionalism

Profession :-

- * It is defined as any job/occupation/vocation.
- * That requires advanced expertise, self regulation and concerted service to the public good. It brings high status, socially and economically.
- * The characteristics of a profession are :

Advanced expertise :- many professions require sophisticated skills (do-how) and theoretical knowledge. Formal education, training, continuing education updating are needed.

Self Regulation :- one should analyse the problem independent of setting standards for admission to profession. Representing the profession before the public and government.

Public Good :- The occupation provide some important public Good.

- Ex :-
- 1) A physician promotes health
 - 2) A lawyer protects the legal rights
 - 3) A engineer provides a product or a project for use by the public towards their health, welfare and safety

Professional :-

Any work that a person does on profession which requires expertise and self regulation.

Professionalism :- It is the status of a professional which implies certain attitude services related to achieving employees and public good.

Professionalism role to be play by an Engineer:-

Promotion of public good is the primary concern of the professional engineers. There are several role models to whom the engineers are attracted. These models influence their thinking, attitudes and actions.

1. Savior:- The engineer as a savior, save the society from poverty, illiteracy, wastage, inefficiency, ill health, human (labor) dignity and lead it to prosperity, through technological development and social planning for example, R.L. Stevenson

2. Guardian:- He guards the interests of the poor and general public. As one who is conversant with technology development, is given the authority befitting his expertise to determine what is best suited to the society. For example, Lawrence of Arabia (an engineer).

3. Bureaucratic Secured:- He serves the organization and the employers. (the engineer) translates the management of an enterprise fixes its goals and assigns the job of problem solving to the engineer, who accept the challenge and shapes them into concrete achievements. For example, Jamshedji Tata.

4. Social Servant: It is one who exhibits social responsibility. The engineer translates the interest and aspirations of the society into a reality, remembering that his true master is the society at large.
For example, Sir M. Visvesvaraya.

5. Social Enabler and Catalyst:
One who changes the society through technology. The engineer must assist the management and the society to understand their needs and make informed decisions on the desirable technological development and minimize the negative effects of technology on people and their living environment. Thus, he shines as a social enabler and a catalyst for further growth.
For example, Sri Sundar Lal Bahuguna.

6. Game player:
He is neither a servant nor master. An engineer is an assertive player, not a passive player who may carry out his master's value. He plays a unique role successfully within the organization, enjoying the excitement of the profession and having the satisfaction of surging ahead in a competitive world.
For example, Narayanamurthy, Infosys and Dr. Kasthuri - rangan, ISRO.

Characteristics of the profession as a distinct from non-professional occupation

Extensive training:-

Entry into the profession requires an extensive period of training and moral character.
For example, MBA is a profession.

Knowledge and Skills:-

- It is necessary for well being of the society.
- It protects us from diseases and restores health.
- Chartered accountant knowledge is important that for financial transactions.
- The knowledge, study and research of the engineers and required for the safety of air plane for the technical advances.

Monopoly:-

There are two types

↓
Those who have graduated from the professional school

↓
The committee to have a licence or system for those who want to enter the profession

Autonomy in workplace:

Professional have the freedom in choosing their clients

For example, lawyers, doctors.

Self-Interest, Customs and Religions:-

"Self Interest:-

- * Self interest means one's personal good. major ethical theories also insist the importance of self interest.
- * A duty ethicist emphasizes duties to ourselves, for our own well being.
- * Rights ethicist insists rights to pursue our own good
- * Virtue ethicist emphasizes the importance of self respect, which means looking after one's own need.

At the same time, each of these theories insists that the self-interest must be balanced by moral responsibilities to other words people.

Let us consider a view that challenges all these theories. This view attempts to reduce morality to the pursuit of self-interest. This view is called "Ethical-egoism". It is ethical "because" this is a theory about morality and egoism.

because it says that the main duty of each individual is to maximize his or her own good.

* Ethical egoism differentiates between narrower and wider forms of self-interest. One who is selfishly preoccupied with one's own good and neglect the good of others, will generally lose friendship and love. Thus the paradox of happiness.

Friendship and love cares for other people either fully or in part for themselves. In professional and business life, when every one is pursuing their self-interest, everyone benefits.

Society benefits more when individuals pursue their private good. Corporations or companies get maximum profits in a competitive market. The idea is, that this will make the economy prosper, thereby benefiting everyone. Self interest is what is good for an individual in the long run.

Customs:

Customs and ethical relativism are law or custom oriented. we live in a diversified society in which tolerance for different customs and outlooks are very important. Ethical pluralism. Views that there may be many moral perceptions that are reasonable. All of them need not be accepted by morally concerned persons.

Customs have great moral significance in guiding us how we should act. we will not challenge that this view is wrong. Instead we think it is true. moral perceptions that means moral values are many and flexible.

"Reasonable persons can have reasonable disagreements on moral issues, including issue in engineering ethics". Ethical relativism says that actions are morally right when they are approved by law or custom. They are wrong when they violate laws or customs. "Ethical egoism" related to self-interest, whereas "Ethical Relativism" related to moral values, laws, conventions and customs of particular societies.

moral reasons allow objective criticism of given laws as immoral. For example "apartheid laws". The case of South Africa's legal system, the laws that violated the human rights of the majority of black citizens. There the human rights were not given legal protection but they morally ought to be. Apartheid laws morally call respect for all people, independent of race.

"Ethical Relativism" is simply descriptive relativism, which states that beliefs about values differ from culture to culture. Descriptive relativism is obviously true, but it is not based on any sound footing. To establish relativism, an example is given below.

Hitler and his followers murdered millions of Jews and justified that they were correct in doing so, according to ethical relativism, because they believed that their laws, customs and beliefs allow them to do so.

"Ethical Relativism" was given importance in older days by cultural anthropologists, because they emphasized that the moral differences between cultures are to be respected. That is why the people in older days practised like head hunting, human sacrifice and cannibalism. These made them believe that "morality is simply what a culture says it is".

Religion:

Moral commitments and religious beliefs are related in several ways. First, they are related historically. For example, Christian tradition has been influential in western countries, Islam has been influential in the middle east countries. Confucianism has been influential in China. Hinduism and Buddhism have been influential in Asian countries. These religions continued to be influential in various countries in a complex and more interactive ways.

Second, for many people there are important psychological connections between their moral beliefs and religious beliefs.

Religious faith or religious hope implies trust. Trust in religion brings an inspiration to be moral. A religion is any set of articles of faith, which is influential in a person making him to perform two functions namely

1. Social functions to provide motivation for the individual to conduct himself altruistically.

2. The personal function is to give the individual courage on occasions of fear, endurance in adversity, strength in moments of weakness, dignity in defeat, humility in success and conscientiousness in exercising the power.

The main social functions of religion is to motivate right action, whereas, personal functions is to promote tolerance and moral concern for others.

Third, religions sometimes set a higher moral standard than conventional, many religions, stressed on virtue ethics that emphasizes particular virtues.

For example, the ethics of Christianity centers on the virtues of hope, faith and love. Buddhism emphasizes compassion. Hinduism emphasizes ahimsa and love.

Now let us view how religion and morality are related "Divine command ethics" says an act is right means it is commanded by God. Accordingly, if there were no God to issue commands, then there would be no morality. Another difficulty arises by this view, that is how do we know exactly what are the God's commands. Another difficulty is in knowing whether God exists.

Long ago Socrates asked - why does God make certain commands and why God doesn't make other commands? "do the commands made on the basis of whom? Surely it is not! God is supposed to be morally good and hence he would neither approve nor command such acts as war, killing, torture and other immoralities."

Theories About The Right Action Ethical Theories uses and Criteria

The ethical theories are useful in many respects.

1. In understanding moral dilemma. They provide clarity, consistency, systematic and comprehensive understanding.
2. It provides helpful practical guidance in moral issues towards the solution.
3. Justifying professional obligations and decisions, and
4. In evaluating ordinary and professional morality.

Different Criteria may be applied for evaluating various ethical theories and deciding upon the best.

1. The theory must be clear and coherent formulated with concepts that are logically connected.
2. It must be internally consistent i.e., none of its principles conflicts with any other.
3. The theory and its defense must direct, only upon facts.
4. It must organize basic moral values in systematic and comprehensive manner. It is to fix priority of values and provide guidance in all situations.

5. It must provide guidance compatible with our moral convictions (judgements) about concrete situations. For example if an ethical theory says that it is all right for engineers to make explosive devices without the informed consent of the public, we can conclude that the theory is inadequate.

Theories and judgments are continually adjusted to each other until we reach a reflective equilibrium. Most of the theories converge towards the welfare of the humanity. The duty ethics and right ethics differ in great extent in their emphasis. But they remain complementary always.

Ethical Theories / Approaches

Several ethical theories have been developed over different times. Each of them stressing certain ethical principles or features. Each stresses a view and many a times, we find that these theories converge and reinforce the ethics in deciding upon the actions and justifying the results.

1. utilitarian Theory

The term utilitarianism was conceived in the 19th century by Jeremy Bentham and John Stuart Mill. To help legislators determine which laws were morally best. They suggested that the standard of right conduct is maximization of good consequences. Good consequences means either 'utilities' or the balance of good over evil. This approach weights the costs and benefits. Right action are the ones that produce the greatest satisfaction of the preferences of the affected persons. In analyzing an issue in this approach, we have to;

- Identify the various courses of action available to us
- Asc who will be affected by each action and what benefits or harms will be done for each.
- Choose the action that will produce the greatest benefits and the least harm.

C.W.D. Ross, the British philosopher, introduced the term *prima facie* duties, which means duties might have justified exceptions. In fact, most duties are *prima facie* ones; some may have obligatory or permissible exceptions. He has listed various aspects of Duty ethics that reflect our moral convictions, namely;

1. Fidelity : duty to keep promises,
2. Reparation : duty to compensate others when we harm them.
3. Gratitude : duty to thank those who help us.
4. Justice : duty to recognize merit.
5. Beneficence : duty to recognize inequality and improve the condition of others
6. Self-improvement : duty to improve virtue and intelligence
7. Non-maleficence : duty not to injure others.

Right Theory

Rights are entitlement to act or to have another individual act in a certain way. Minimally, rights serve as a protective barrier, shielding individuals from unjustified infringement of their moral agency by others. For every right, we have a corresponding duty of noninterference.

A. The RIGHTS approach to ethics has its roots in the Immanuel Kant, who focused on the individual's right to choose for oneself. According to him, what makes human beings different from mere things is, that people have dignity based on their ability to choose freely.

The ACT UTILITARIAN theory proposed by J.S. Mill (1806-73) focuses on actions, rather than on general rules. An action is right, if it generates the most overall good for the most people involved.

The RULE UTILITARIAN theory, developed by Richard Brandt (1910-97), stressed on the rules, such as do not harm others, do not steal, do not bribe, as a primary importance. He suggested that individual actions are right when they are required by set of rules which maximizes the public good. The process is unfair although this results in promotion of overall good.

2. Duty ethics

A. The Duty ethics theory, proposed by Immanuel Kant (1724-1804) states, that actions are consequences of performance of one's duties such as, 'being honest', 'not cause suffering of others', 'being fair to others including the meek and weak', 'being grateful', 'keeping promises', etc. The stress is on the universal principle of respect for autonomy i.e., respect and rationality of persons. A businessman is to be honest because honesty pays - in terms of profits from customers and from avoiding fall for dishonesty.

B. On the other hand, the DUTY ethics theory, as enunciated by John Rawls, gave importance to the actions that would be voluntarily agreed upon by all persons involved, assuming impartiality.

what they will do with their lives, and they have a fundamental moral right to have these choices respected.

1. The right to access the truth
2. The right of privacy
3. The right not to be injured.
4. The right to what is agreed

B. In deciding whether an action is moral or immoral we must ask, does the action respect the moral rights of everyone? Actions are wrong to the extent that they violate the rights of individuals; the more serious is the violation, the more wrongful is the action. The RIGHTS theory as promoted by John Locke states that the actions are right, if they respect human rights of every one affected. He proposed the three basic human rights, namely life, liberty, and property, his theories were reflected in the modern American society, when Jefferson declared the basic rights as life, liberty, and pursuit of happiness.

C. Human Rights:

Human rights are explained in two forms, namely liberty rights and welfare rights, liberty rights are rights to extend one's liberty and classes duties on other people not to interfere with one's freedom. The four features of liberty rights (also called moral rights), which lay the base for Government Administration are:

1. Rights are natural in so far as they are not invented or created by government.
2. They are universal, as they do not change from country to country.

3. They are equal while the rights are the same for all people, irrespective of caste, race, creed or sex.

4. They are inalienable i.e., one cannot hand over his rights to another person such as selling oneself to slavery.

D. Economic Rights

In the free-market economy, the very purpose of the existence of the manufacturer, the seller and the service providers is to serve the consumer.

4. The Virtue Theory

This emphasizes on the character rather than the rights or duties. The character is the pattern of virtues. The theory advocated by Aristotle, stressed on the tendency to act at proper balance between extremes of conduct, emotion, desire, attitudes to find the golden mean between the extremes of excess or deficiency. The examples shown below illustrate the theory.

Virtue	Excess	Golden mean	Deficient
Truthfulness (genuine communication).	Revealing all in violation of fact and confidentiality	Necessary and suitable, to proper person	Deceptive
Courage (fear danger, risk).	Recklessness bold	fear and humble.	cowardice
Generosity (giving)	Wasting resources	give in appropriate measure	misery
Faithfulness (genuine relationship).	without anger, effusive	within defined limits	Bad-tempered
Green environment	exploitation	protection	neglect
Work and earn	Boresome work	Balance of work and leisure	Lazy (no work) and more pay.

On other hand. The virtue theory proposed by MacIntyre, highlighted on the actions aimed at achieving common good and social (internal) good such as social justice, promotion of health, creation of useful and safe technological products and service.

5. Self-relaxation theory

Right action consists in seeking self-fulfillment. In one version of this theory, the self to be realized is defined by caring relationship with other individuals and society. In another version called ethical egoism, the right action consists in always promoting what is good for one self. No caring and society relationship are assumed.

6. Justice (Fairness) Theory:-

The justice or fairness approach to ethics has its roots in the teachings of the ancient Greek philosopher Aristotle, who said that equals should be treated equally and unequals unequally. The basic moral question in this approach is: How fair is an action? Does it treat everyone in the same way, or does it show favoritism and discrimination?

Issues create controversies simply because we do not bother to check the fairness of justice. Favoritism gives benefits to some people without a justifiable reason for singling them out; discrimination imposes burdens on people who are no different from those on whom burdens are not imposed. Both favoritism and discrimination are unjust and wrong.

Professional Ethics:

Professionals are expected to observe personal, organizational and corporate standards of behavior, knowledge and skill. Professional ethics refer to the moral standards or ethics observed by the professionals in the process of using this knowledge which involves rendering a service to the public.

Professionals are capable of making judgements. They apply their professional skills (gained through focused training or mentoring) and reach informed decisions in situations that the general public cannot.

Components of professional ethics Some professional organizations define their ethical approach in terms of a number of discrete components. Typically these include: honesty, integrity, transparency, accountability, confidentiality, objectivity, respect for other, legal compliance and loyalty.

The three types of inquiries, in solving ethical problems are: normative inquiry, conceptual inquiry, and factual or descriptive inquiry.

The three types of inquiries are discussed below to illustrate the differences and preference.

1. Normative Inquiry:

It seeks to identify and justify the morally-desirable norms or standards that should guide individuals and groups. It also has the theoretical goal of justifying particular moral judgements. Normative questions are about what ought to be and what is good, based on moral values. For example,

1. How far does the obligation of engineers to protect public safety extend in any given situation?
2. When, if ever, should engineers be expected to blow whistle on dangerous practises of their employers?
3. Whose values ought to be primary in making judgement about acceptable risks in design for a public transport system on a nuclear plant? Is it of management, senior engineers, government, voters or all of them?
4. When and why is the government justified in interfering with the organisations?
5. What are the reasons on which the engineers show their obligations to their employees or clients or the public?

2. Conceptual Inquiry:

It is directed to clarify the meaning of concepts or ideas or principles that are expressed by words or by questions and statements. For example,

- a) What is meant by safety?
- b) How is it related to risk?
- c) What is a bribe?
- d) What is a profession?

When moral concepts are discussed, normative and conceptual issues are closely inter connected.

3. Factual or Descriptive Inquiry:

It is aimed to obtain facts needed for understanding and resolving value issues. Researchers conduct factual inquiries using mathematical or statistical techniques. The inquiry provide important information on business realities, engineering practice, and the effectiveness of professional societies in fostering moral conduct, the procedures used in risk assessment, and psychological profiles of engineers. The facts provide not only the reasons for moral problems but also enable us to develop alternative ways of resolving moral problems. For example,

1. How were the benefits assessed?
2. What are procedures followed in risk assessment?
3. What are short-term and long-term effects of drinking water being polluted? and
4. Who conducted the tests on materials?

Kohlberg Theory:-

Moral development in human being occurs over age and experience. Kohlberg suggested there are three levels of moral development, namely pre-conventional, conventional, and post-conventional, based on the type of reasoning and motivation of the individuals in response to moral questions.

In the pre-conventional level, right conduct for an individual is regarded as whatever directly benefits oneself. At this level, individuals are motivated by obedience or the desire to avoid punishment or to satisfy their own needs or by the influence by power on them. All young children exhibit this tendency. At the conventional level, people respect the law and authority. Rules and norms of one's family or group or society is accepted, as the standard of morality. Individuals in this level want to please or satisfy, and get approval by others and to meet the expectations of the society, rather than their self interest (e.g., good boy, good girl). Loyalty is regarded as most important. Many adults do not go beyond this level.

At the post-conventional level, people are called autonomous. They think originally and want to live by universally good principles and welfare of others. They have no self-interest. They live by principled conscience. They follow the golden rule, 'Do unto others as you would have them do unto you'. They maintain moral integrity. Self-respect and respect for others.

Kohlberg believed that individuals could only progress through these stages, one stage at a time. He believed that most of the moral development occurs through social interactions.

2. Gilligan's Theory:

Carol Gilligan found that Kohlberg's theory had a strong male bias. According to Gilligan's studies, men had a tendency to solve problems by applying abstract moral principles. Men were found to resolve moral dilemma by choosing the most important moral rule, overruling other rules. In contrast, women gave importance

to preserve personal relationships with all persons involved. The context oriented emphasis on maintaining personal relationships was called the ethics of care, in contrast with the ethics of rules and rights adopted by men.

Gilligan revised the three levels of moral development of Kohlberg, as stages of growth towards ethics of caring. The pre-conventional level, which is same as that of Kohlberg's first one, right conduct, is viewed in a selfish manner solely as what is good for oneself. The second level called conventional level, the importance is on not hurting others, and willing to sacrifice one's own interest and help others. This is the characteristic feature of women. At the post-conventional level, a reasoned balance is found between caring about others and pursuing the self-interest. The balance one's own need and the needs of others, is aimed while maintaining relationship based on mutual caring. This is achieved by context-oriented reasoning, rather than by hierarchy of rules.

The theories of moral development by Kohlberg and Gilligan differ in the following respects.

Kohlberg's Theory	Carol Gilligan's Theory
<u>A. Basic Aspects</u>	
1. Is based on the study on men.	1. Is based on the study on men and women.
2. Men give importance to moral rule.	2. Women always want to keep up the personal relationships with all the persons involved in the situations.
3. Ethics of rules and rights.	3. Women give attention to circumstances leading to critical situations rather than rules. (context-oriented and ethics of care)

B. Characteristic Features

1. Justice
2. Factual
3. Right or wrong
4. Logic only
5. Logic and rule-based
6. Less of caring
7. Matter of fact (practical)
8. present focus
9. strict rules
10. Independence
11. Rigid
12. Taking a commanding role
13. Transactional approach

1. Reason
2. Emotional
3. Impact on Relationships
4. Compassion too
5. caring and concern
6. More of caring
7. Abstract
8. Future focus
9. Making exceptions
10. Dependence
11. Human-oriented
12. Shying away from decision-making
13. Transformational approach

The difference in these two theories is explained through the well-known example, Heinz's dilemma. Heinz being poor and a debtor could not buy the costly medicine for his sick wife, at ten times the normal cost. Initially he begged the pharmacist to sell at half the price or allow him to pay for it later. Pharmacist refused to oblige him either way. Finally he forcibly entered the pharmacy and stole the drug.

According to Kohlberg's study, men observed that the theft was morally 'wrong' at the conventional level, because the property right was violated. But men at the post-conventional level, concluded that the theft was 'right', as the life of the human being was in danger. But women observed that Heinz was wrong. They observed that

instead of stealing he could have tried other solutions (threatening or payment in installments?) to convince the pharmacist. Gilligan however attributed the decision by women as context-oriented and not on the basis of rules ranked in the order of priority.

UNIT-3

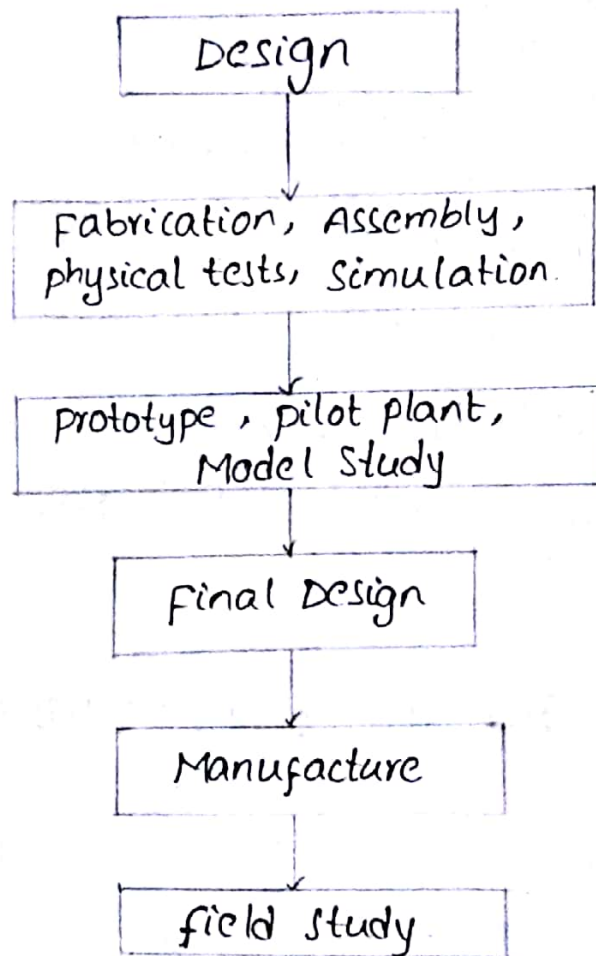
VSM College
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3. Engineering As Social Experimentation *

comparison with Standard Experiments - Knowledge gained - conscientiousness - Relevant Information - Learning from the past - Engineers as Managers, consultants and leaders - Accountability - Role of codes - codes and Experimental Nature of Engineering.

ENGINEERING AS EXPERIMENTATION

Before manufacturing a product or providing a project, we make several assumptions and trials, designs and redesigns and test several times till the product is observed to be functioning satisfactorily. we try different materials and experiments. from the test data obtained we make detailed design and retests. Thus, design as well as Engineering is iterative process as illustrated in the figure.



Several redesigns are made upon the feedback information on the performance or failure in the field or in the factory. Besides the tests, each engineering project is modified during execution, based on the periodical feed back on the progress and the lessons from other sources. Hence, the development of a product or a project as a whole may be considered as an experiment.

COMPARISON WITH STANDARD EXPERIMENTS

Experimentation plays an important role in the design process. preliminary tests are conducted from the time when it is decided to make a product in the following order.

1. Engineering concept.
2. Rough design.
3. Detailed design.
4. production stage tests.
5. finished product.

Beyond the specific tests and experiments, however, each engineering project may be viewed as an experiment.

Similarities to Standard Experiments:-

Engineering projects are to be viewed as Engineering experiments. First, any project is carried out in partial ignorance. There are uncertainties in the model, in the characteristics of materials purchased, in the constancies of materials, about the nature of the stresses the finished product will bear with.

Sometimes, laboratory testing may be bypassed for the sake of completion of the project well ahead of time.

Second, the final outcomes of engineering project like those of experiments are generally uncertain. The outcome of some projects may involve great risks. For example, a reservoir construction (dam) may do damage to the local area and people or to its ecosystem. If the dam leaks or breaks, it cannot even serve the purpose.

A nuclear reactor may exhibit unexpected problems that may endanger surrounding population, leading to its shutdown, at greater cost to the owner and consumers. A hair dryer may expose the user to living damage from the asbestos insulation in its barrel.

Third, effective engineering depends upon knowledge gained about products, both before and after they leave the factory. Knowledge is needed for improving current products and creating better ones. Monitoring is thus essential in engineering as it is for experimentation in general. To monitor is, to make periodic observation and test in order to check for successful performance.

Knowledge Gained:-

Many professional courses such as dental or medicine have one year of internship or on the job training to give the student the real time experience. Books cannot be the substitute experience makes the professional more versatile and adopt.

The process of gaining knowledge is a continuous phenomenon through out the life.

The truth comes from practice and experience. one should spend time on job to learn.

work experience is the rich source of knowledge, and it supplements well the knowledge gained from the books, internet, class room, part time assignments, internship etc.

foreign assignments, technology, transfers, full time/part time research, position also become the significant sources of knowledge every project is an experiment that involves technology development.

Conscientiousness:-

conscientiousness means "conscience"

here the intension alone is not sufficient open eyes open ears and open minded are requisited to understand a given situation open eyes and it's implications the people who are involved or affected are to be take care of.

About 90% of engineers are salaried employers most of them work under large managements and they are under pressure to function smoothly with the organisation.

Engineering as social experimentation the engineers have to be act as guardians of the public interest their professional duties are to guard the welfare and safety of the public affected by engineering projects.

Engineers as social guardian should not force their force the social upon the society their views are to be implemented with the consent of the people.

Relevant Information:-

Information is any material in any form. It includes records, documents, memos, e-mails, opinions, advices, press releases, circulars, orders, logbooks, contracts, reports, papers, samples, models, data material held in any electronic form. It also includes information relating to any private body which can be accessed by any one.

For decision making, relevant information is the base. In this context, information means the facts and figures gathered from records or research or could be even from experience. Relevant information has to be gathered, recorded and transmitted as it impacts every outcome. Information is said to be of value and relevance only when it is

- a) accurate and
- b) provided at the right time
- c) submitted to the right people.
- d) specific and stick to the necessity or purpose.
- e) Meaningful and make sense for further insights.

Information can be managed efficiently either in physical or electronic form. It is the responsibility of the organisation to create an information system for managing, storing, sharing, preserving, retrieving and delivering value.

There are different tools such as fireproof cabinets, Hard disk drive (HDD), memory stick etc to store information as hard copies or soft copies and retrieve as and when required. To maintain the confidentiality, a system has to be in place with proper accountability on concerned officers. Otherwise, organisations fail to provide quality service and this will affect the smooth running of the company. The organisations should train their employees to be sensitive to protect, preserve and retrieve all information in accordance with business, legal and policy requirements. Right to Information Act has made the job of information seekers very easy and this has put more responsibility on the organisations to provide the information sought within a time frame.

Learning from the past:

Engineers normally learn from their own prior designs and infer from the analysis of operations and results, and sometimes from the reports of other engineers. But this does not happen frequently. The absence of interest and channels of communication, ego in not seeking information, guilty upon the failure, fear of legal actions, and mere negligence have caused many a failure. A few examples are as follows.

1. Titanic ship lacked sufficient number of life boats and a safe exit for passengers and crew. A similar damage was caused on the ship "Arctic" a few decades ago. This experience was not taken into account while designing the Titanic Ship.
2. The bridge at Tambo bay, Florida, USA, failed due to the impact force by a ship on the bridge. The bridge was not designed with horizontal impact forces because the code book did not mention it.

3. A Bridge in Wales (UK) collapsed during construction. This gave an experience to the design engineers, but, this experience was not applied when a similar bridge was constructed by the same bridge builder in Melbourne, Australia. This bridge also collapsed killing a number of people.
4. Valves are the least reliable components of hydraulic systems. It was a pressure relief valve. Lack of information regarding its opening or closing state, contributed to the nuclear reactor accidents at Three miles Island USA in 1979. Similar malfunctions had occurred with identical valves on nuclear reactors at other places.

The above examples illustrate that the lessons learnt due to the failure of one project was not given due to consideration by the engineers or by the designers while designing the project of same nature second time or third time.

Just like experimentation, engineers should remain alert and well informed at every stage of a project's history.

Engineers as Managers, consultants & Leaders.

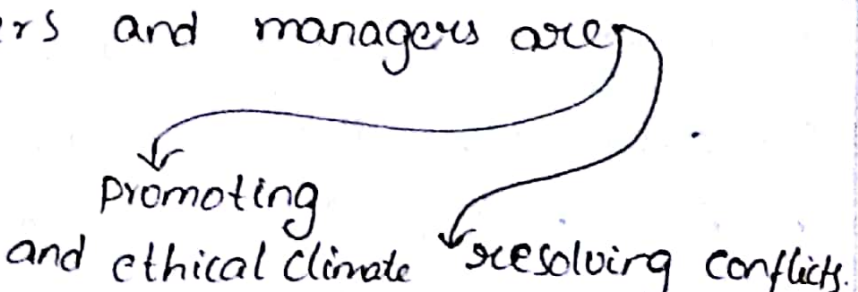
Engineers as Managers:-

Engineers undergo intensive technical training compared to any other professionals but many of them move into managerial cadre for which they received little training as under graduate students.

Many companies prefer engineers as managers because the technical understanding of engineers is essential to manage corporations. It is easier to teach engineers the business side of corporations than to teach non-engineering graduates. corporations recognize engineer's general strengths in analysis, their strong work ethic, and their confidence in problem solving.

Engineers are given higher salaries, greater authority and wider responsibility. But in practise engineers are given less recognition within the business culture, for reasons unknown.

It required knowledge about finances and scheduling skills on coordination and motivating other people.

- * They should have to ability to make risk to take decision.
- * Managers have responsibilities to employers, customers, delayers, suppliers and general public.
- * But engineers by contrast are professionals to have responsibility to protect public safety held and welfare of the public in addition to their responsibilities to stock holders.
- * Good business ethics and good sound ethics go together in the long run. The two responsibilities of engineers and managers are

 - Promoting and ethical climate
 - Resolving conflicts.

Promoting and ethical climate :-

Good relation ship with employers an ethical climate is an working environment which can drive to moral conduct and behaviour engineers make a vital contributions into such a climate that manager have greater responsibility than engineers.

Tata birla, Reliance, Tvc, Tvs, L&T
Such group repeated companies are example of large corporations. They develop a successful ethical climate.

Managing Conflicts:-

managers have the authority and the responsibility to resolve conflicts, which threaten corporate efficiency the climate weapon is force. "I am incharge", "Do what I say", "I will fire you"!

The manager's task is create an ethical climate in which conflicts are attended constructively.

The types of conflicts that may arise among the persons are as follows.

- ① conflicts over schedules
2. "conflicts regarding" which project and department the organisation most important to the organisation at a given time.
3. conflicts over personal resources made available for projects.

4. conflicts over technical institutes.
5. conflicts over administrative procedures.
6. personality conflict and
7. conflicts over costs.

People:-

Generally conflicts involves person who are the respected and recognised understanding the problem from their point of view is more important than showing their point of view authorities of higher officers have to communicate with their

Interest:-

Importance is to be given on Interest person not on the profession.

Options:-

A number of possibilities may be thought of before taking final decisions

Criteria:-

Result of conflicts should be based on some goal of the company.

Engineers as Consultants:-

Engineers do private practise they receive price for their services. They undergrow the clients. They don't receive any salaries from employees. Because of this they have greater freedom to make decision about the projects. They undertake any how they have to share anything in common with salaried engineers.

Advertising:-

Some corporate are involved in advertising because they work in products sales division. Consulting engineers as advisers has greater responsibility for advertising their services.

Competative Bidding:-

It means quoting for the cost of the project confidentially. The work of a project is allowed based on low bidding without reduction in quality.

Contingency fees:-

It is amount paid to the consulting engineer, based on the performance of satisfactory work. Contingency fees is paid to the consultant. This is the reason why a client prefer consultant. A consultant is expected to save maximum on atleast 10% of the project cost. If the consultant fails to do so, no contingency fee is paid. The fee paid may be sum as agreed upon or a fixed percentage of the savings.

Resolution disputes:-

Large engineering projects involve the owner, the consulting engineer and the construction company. In such big pictures, there may arise an inability to resolve disputes can be better used to improve the quality of the project.

Engineers as expert witness & advisors:-

Engineers have to serve as consultant to provide expert certificate in the court of law. They should be natural and following the path of truth.

Engineers have to certify the no. of cases, the defective products, personal injury, damage to property, accidents or damage, they have seen by their own eyes expert witness.

Many counsels such as serve to certify on facts and figures in their areas of expertise

- ① Hired guns.
- ② financial biases.
- ③ Ego biases.
- ④ Sympathy biases.

1. Hired guns:-

A few engineers violate ethical standards while conducting investigation and act as "Hired guns". Thus engineers spoil the reputations of entire group of engineers when they serve as expert witness.

A simple example is given below.
Masan falls while coming down a ladder and is seriously injured.

financial biases:-

Engineers receiving money from one side will give raise to a form of bias through it is small amount financial or money bias will influence or ones investigations and certifications.

Ego biases:-

Engineers generally give importance to the dispute of their own side. They always see the opponent as guilty and his own side is always right.

In order to get affections from their clients. They always are inclined to serve the interest of their own clients.

Sympathy biases:-

Sometimes court is like a drama stage in which the suffering of people is exposed.

The victims plight can be easily understood though they are opponent clients.

Moral Leadership:-

Engineers as academicians, managers and government servants are to shoulder various forms of leadership.

Engineers as Leaders:-

1. Managers
2. Business entrepreneurs
3. consultants
4. Academics and
5. Govt. officials.

Leadership is successfully moving a group towards its common goal. The individuals, who direct, motivate, organise creatively manage and move groups towards morally valuable goods.

Technologists were best qualified to govern because of their technical expertise, as well as their logical practical and unprejudiced minds.

Ex:- Frederick Taylor.

Moral Creativity:-

Identifying most important values in particular situations. focussing on them through effective communication with in the group. Deep commitment grounded in integrities to implement them.

creativity consists in identifying new possibilities for applying, extending and putting into practice rather than investing values.

Participation professional Societies will improve moral Leadership:-

professional Societies:-

1. promote continuing education for their members.
2. The profession speak and act on behalf of them.
3. Act as a forum for communicating organizing and mobilizing change with in a change which has a moral dimension.
4. But they can play a role in resolving moral issues.
5. A moral responsibility as well as moral creativity shared.

Robust:-

- a. conceptual strength.
- b. preliminary designs.
- c. more detailed design.
- d. production.
- e. public reaction.

- f. collection of feedback from the select customers.
- g. fine tuning the product based on the complaint.

Good design relies on information gathered before and after a product leaves the factory especially when the product is tested in its true "Environment" not take ones used to stimulate the real environment.

eg:- Temperature cycling electronic products.

The real test is the feedback from the public who use the product. If the feedback is good go on improving the product. If the feedback is negative, go on identifying the bugs and try to fix them.

Accountability

Responsible people accept moral responsibility for their actions. "Accountable", sometimes is understood with a sense of being faulty or blame worthy for misdeeds but the term "accountable" generally means that one is willing to submit to one's actions. One is to be open and responsive for the assessment by others.

Submission to an employer's authority or any authority for that matter, creates a narrow sense of accountability for the consequences of their actions. A psychologist says that there is a strong psychological tendency among people to abandon personal accountability when they are placed under authority.

Role of Codes

Professional Societies or professional Bodies :—

Codes of Ethics are rules and regulations or guide lines drawn by professional society, which makes a professional to act ethically.

The following are the professional societies or bodies which are responsible for drawing the code of ethics.

In India :-

- 1) Institution of Engineers, India (IEI) - for Engineers.
- 2) Medical Council of India (MCI) - for doctors.
- 3) Bar Council of India (BCI) - for Lawyers.

In USA :-

- 1) Accreditation Board for Engineering & Technology (ABET)
- 2) National Society of Professional Engineers (NSPE)
- 3) Institution of Electrical and Electronics Engineers (IEEE).

Limitation of Codes :-

Most codes are limited in many ways. Codes provide only a very general guidance for engineers to exercise their moral responsibilities, as social experiments. They cannot expect codes to solve their moral problems in all cases. Hence the limitations of codes are as follows:

- 1) Codes are general guidelines. They may not be directly applicable to all situations. "A sense of responsibility" is required by any professional for the correct application of code guidelines to a given situation.
- 2) Different entries in codes come into conflict with each other providing no guidance as to which entry has to be given priority. In such cases moral dilemmas arise.
For example

Code Section-1 :-

Engineers will act in professional matter for each client or an employer as a faithful agent

Code Section-2 :-

The Engineer will have the proper regard for the safety, health and welfare of the public in discharging his professional duties.

Suppose a company, in the interest of the company takes a decision such that the decision is threatening to the public safety. Under these circumstances, the Engineer is in dilemma, whether he has to be faithful to his employer or he has to take care of the safety of the public?

Code Section-3 :-

The 3rd limitation on codes is that, they cannot serve as the final moral authority for professional conduct.

The 4th limitation of codes is, "how can there exist different codes for different professional engineering societies?" This gives the members a feeling that ethical conduct is more relative than it is.

The time has come for adoption of uniform codes by all engineering professional society. The current codes are not perfect but they are steps towards the right direction.

Code of Experimental Nature of Engineering :

The corporate Members of the Institution of Engineers are committed to promote and practice the profession of engineering for the common good of community bearing in mind the following concerns

- ① concern for ethical standard
- ② concern for social justice, social order and human rights
- ③ concern for protection of Environment
- ④ concern for sustainable development
- ⑤ public safety and tranquility

The tenets of the code of Ethics :

- ① A corporate Member shall utilize his knowledge and expertise for the welfare, health and safety of the community without any discrimination of sectional or private interests
- ② A corporate member shall maintain the honour, integrity and dignity in all his professional

action to be worthy of the trust of the community and the profession

③ A corporate Member shall act only in the domains of his competence and with diligence, care, Sincerity and honesty

④ A corporate Member shall apply his knowledge and expertise in the interest of his employer or clients for whom he shall work without compromising with other obligations to these tenets

⑤ A corporate Member shall not falsify or misrepresent his own and his associations qualifications, experience etc.,

⑥ A corporate Member, wherever necessary and relevant, shall take all reasonable steps to inform himself, his employer or clients, of the environmental, economic, social and other possible consequences, which may arise out of his actions

⑦ A corporate Member shall maintain utmost honesty and fairness in making statement or

giving witness and shall do so on the basis of adequate knowledge

⑧ A corporate Member shall not directly or indirectly injure the professional reputation of another member

⑨ A corporate Member shall reject any kind of offer that may involve unfair practice or may cause avoidable damage to the eco-system

⑩ A corporate Member shall be concerned about and shall act in the best of his abilities for maintenance of sustainability of the process of development

⑪ A corporate Member shall not act in any manner which may injure the reputation of the Institutions or which may cause any damage to the Institution financially or otherwise

General Guidance :

The tenets of the code of Ethics are based on the recognition that

① A common tie exists among the humanity and that the Institution of Engineers derives its value from the people, so that the actions of its corporate members should indicate the member's highest regard for equality of opportunity, social justice and fairness

② The corporate Members of the Institution hold a privileged position in the community as to make it a necessity for them not using the position for personal and sectional interests

Responsibilities for a corporate Member :

① Should keep his employer or client fully informed on all matters in respect of his assignments which are likely to lead to a conflict of interest or when, in his judgement, a project will not be viable on the basis of commercial or any other risks

② Should maintain confidentiality from any www.FirstRanker.com

with utmost sincerity unless expressly permitted to disclose such information or unless such permission if withheld, may adversely affect the welfare, health and safety of the community

③ should neither solicit nor accept financial or other consideration from any one related to a project or assignment of which he is in charge

④ should neither pay nor offer direct or indirect inducements to secure work.

⑤ should compete on basis of merit alone

⑥ should refrain from inducing a client to breach a contract entered into with another duly appointed engineer

⑦ should, if asked by the employer or a client to reveal the work of another person or organisation, discuss with the other persons or organisations to arrive at a balanced opinion

⑧ Should make statements or given evidence before

tribunal or court of law in any objective and accurate manner and express any opinion on the basis of adequate knowledge and competence

⑨ Should reveal the existence of any interest pecuniary or otherwise which may effect the Judgement while giving an evidence or making a statement

Any decision of council as per provisions of the relevant byelaw of the institution shall be final and binding on all corporate Members

code of Ethics by the Institution of Engineers,

India - IE(I) :

While the engineers practice their profession for the welfare of the community, they have to bear in their mind the following

- ① Ethical standard
- ② Social Justice, social order and human rights
- ③ Protection of environment
- ④ Public safety and peace

for Engineering and Technology

The fundamental Principles

Engineers uphold and advance the Integrity, honour and dignity of engineering profession by :

- ① Using their knowledge and skill for the enhancement of human welfare
- ② Being honest and Impartial, and serving with fidelity the public, their employers and clients
- ③ Striving to increase the competence and prestige of the engineering profession and
- ④ Supporting the professional and technical societies of their disciplines.

The fundamental Canons

- ① Engineers shall hold paramount the safety, health and welfare of public in the performance of their professional duties.
- ② Engineers shall perform services only in the areas of their competence.

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

code of ethics by Institute of (Ethi) Electrical and Electronics Engineers :

Article I

Member shall :

- ① Accept responsibility for their actions

- ② Be honest and realistic in claims and estimates from available data
- ③ Undertake technological tasks and accept responsibility only if qualified or experienced.
- ④ Maintain their professional skills the highest level and be aware of the importance of current events in their works
- ⑤ Maintain the integrity and prestige of the profession by practising in a dignified manner

Article II:

Members shall, in their work:

- ① Treat fairly all colleagues and coworkers, irrespective of race, religion, sex or nation
- ② Report, publish and disseminate freely information to others, subject to legal and proprietary restraints
- ③ Encourage colleagues and coworkers to act in accordance with this code and support them when they do so

Appreciate the contribution of others

⑤ Support and participate in the activities of their professional societies

⑥ Assist colleagues and co-workers in their professional development.

Article III :

Members shall :

① Act as faithful agents or trustees for their employers or clients in professional matters

② keep information on the business affairs or technical processes of an employer or client in confidence

③ Inform their employers clients about circumstances that could lead to conflict of interest.

④ Neither give nor accept, directly or indirectly any gift or payment from those harming business relationship with their employers or clients

⑤ Assist their employers or clients in anticipating the possible consequences of the projects or plans

code of Ethics by American Society of Civil

Engineers (ASCE):

Fundamental Principles :

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

Fundamental Canons :

- ① Engineers shall perform services only in areas of their competence
- ② Engineers shall issue public statements only in an objective and truthful manner
- ③ Engineers shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflict of interest

④ Engineers shall build their professional reputation on the merit of their services and shall not compete unfairly with others. Engineers shall act in such a manner as to uphold and enhance the honour, integrity and dignity of engineering profession

⑤ Engineers shall continue their professional development throughout their careers, and shall provide opportunities for the professional development of those engineers under their supervision.

Code of Ethics by American Society of Mechanical

Engineers (ASME):

The fundamental principles:

① Using their knowledge and skill for enhancement of human welfare

② Engineers shall associate only with reputable persons or organizations

③ Engineers shall build their professional reputation on the merit of their services

④ Engineers shall perform services only in the areas of competence

Fundamental canons:

- ① Engineers shall negotiate contracts for professional services on the basis of demonstrated competence and qualifications for the type of professional service required.
- ② Engineers shall not knowingly associate with or permit the use of their names or firm names in business ventures by any person or firm which they know, or have reason to believe, are engaging in business or professional practices of a fraudulent or dishonest nature.

Engineer's Responsibilities and Rights

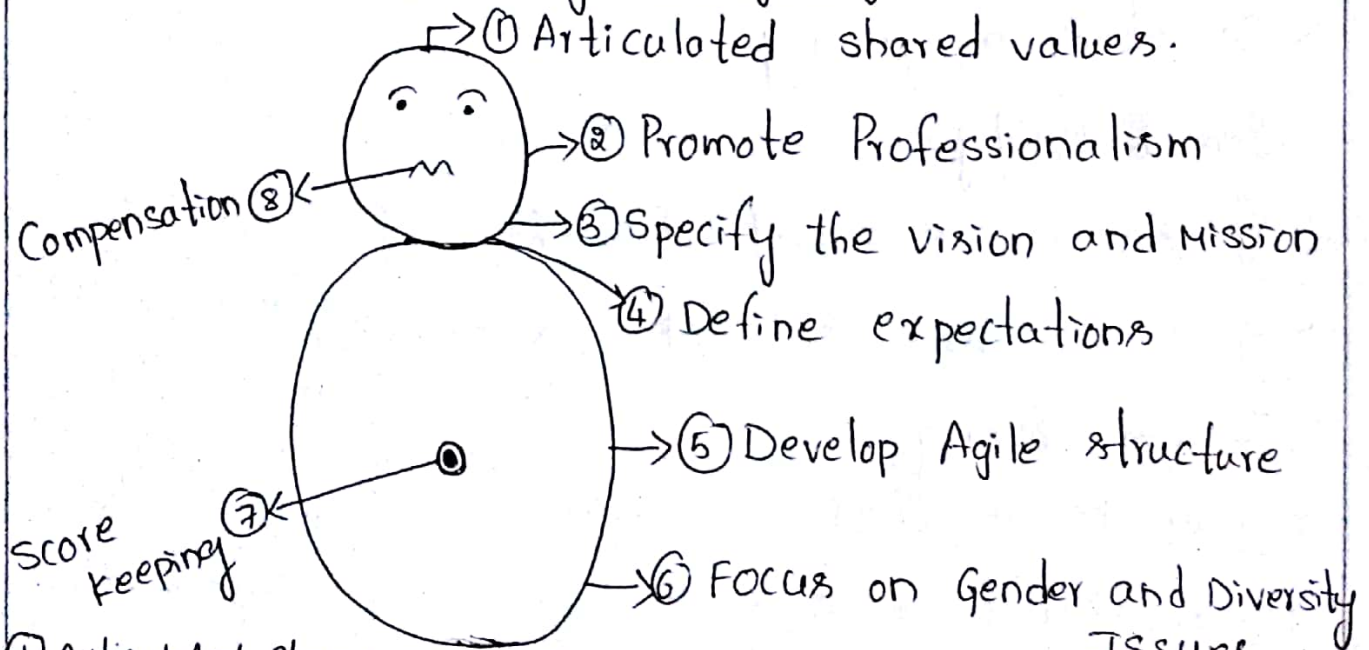
- Collegiality - Techniques for achieving collegiality.
 - Two Senses of loyalty - Obligations of loyalty
 - Professionalism and loyalty.
 - Professional rights.
 - Professional responsibilities.
 - Confidential and Proprietary information.
 - Conflict of interest - solving conflict problems.
 - self interest, customs and Religion.
 - Ethical Egoism.
 - Collective bargaining.
 - Confidentiality.
 - Acceptance of Bribes/Gifts - when
 - Bribe - examples of Gifts vs Bribes.
 - Problem solving.
 - Interests in other companies.
 - Occupational crimes
 - Industrial espionage
 - Price Fixing
 - Endangering lives
- } Types of occupational crimes.

→ Whistle Blowing- types of whistle blowing- when
→ should it be attempted- Preventing whistle Blowing.

COLLEGIABILITY:

Collegiality means the relationship between colleagues who work together in a profession or service. colleagues work as a team for a common purpose and respect each other's abilities and competencies to work in that direction. Collegiality is the respect for another's commitment to the common purpose and ability to work towards it.

Techniques for achieving Collegiality:



① Articulated shared values: In every organisation, one can identify a handful of persons who come together and think of a purpose to achieve.

② Promote Professionalism: Promote a culture of Compatibility, Good behaviours that reflects, civility, courtesy, respect, Fair dealing and honesty.

3. Specify the vision and mission :-

Vision :- is the dream what one wishes to achieve

eg:- Infosys - Naxayana Muxthy.

Mission:- is what you want to achieve immediately
Say next 5 years.

4. Define expectations :- Establish and articulate a criteria in terms of overall commitment, investment amounts, Business targets, Commitment for Business development etc.

5. Develop Agile Structure :- once the expectations are in place, managing expectations through a Facilitating organizational Structure is essential.

6. Focus on Gender and Diversity Issues :- By Gender Issues, we mean giving prominence to feminine and minorities in the work groups. Diversity means taking care of employees of different age groups, functional expertise, nationalities or regions.

7. Score keeping:- keep track of what are the individual achievements of each member and let the rewarding system be based on the individual and team scores.

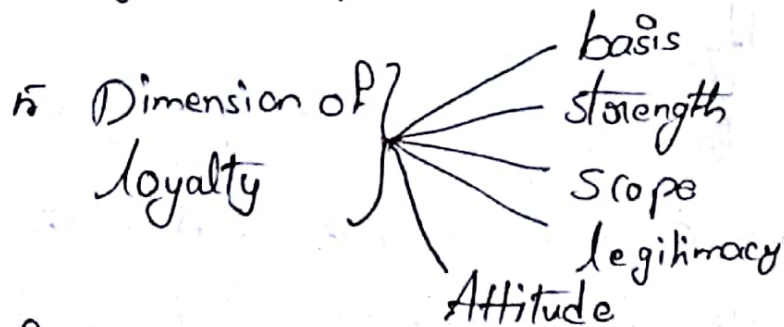
8. Compensation:- How much do you earn and how the earnings are distributed to the members are the critical functions that affect collegiality. Strive to achieve reasonable profitability on a per partner basis, if it is a partnership firm. And also identify how the profits are to be shared among the partners based on their skill set, contribution to business in terms of time and capital.

Two Senses of loyalty - obligations of loyalty professionalism and loyalty

Two Senses of loyalty

Meaning: Loyalty is faithfulness or a devotion to a Person, Country, group or Cause. It is also viewed as personal devotion. One who is loyal is one who is lawful. A Person who is loyal willfully offers everything including his life to a cause. Loyalty is practiced and hence it is practical. Loyalty is a wholehearted commitment to a cause.

→ A loyal person is bound to have many other virtues such as truthfulness, Justice and courtesy. Loyalty can vary from person to person



Professionalism & loyalty

→ Professionals are characterised by this loyalty to the job. They show punctuality a high performance in the given task. They also show lot of concern and positive feelings towards & others.

Two Senses of loyalty

Agency
loyalty

Identification
loyalty

Agency loyalty :- It is acting to fulfill one's contractual duties to an Employer. For these duties, one is paid. It is a matter of actions, whatever may be motives.

Identification loyalty :- It is good attitudes, emotions and a sense of personal identity, along with one's action. Professionals who do their work joyfully are not loyal to their Employers even though they perform their work with responsibilities.

In both senses, loyalty is a desirable character code of ethics. Asst. that engineers ought to be loyal to their Employers.

Obligations of loyalty :-

① Agency loyalty : to employers is an obligation. Identification loyalty to an employer is not so. A professional has to be responsible and discharge his/her duties to the best of his/her ability to his/her Organisation.

It is an obligation to fulfill his/her contractual duties to the Employer. But for the Engineers, the Paramount obligation is still "the safety, health and welfare of the public."

② Attitude loyalty (or Identification loyalty)

It is concerned with the attitudes, emotions and a sense of personal identity. It includes willingness to meet moral duties, with attachment, conviction and trust with Employer. This type of loyalty is all right when the organizations work for productivity or development of community.

③ Professional Rights



means

Employee Rights.

1) Moral Rights :- These rights may be moral or legal. These rights include some of the Professional rights such as the right to disobey the unethical instructions and the right to express their dissatisfaction on the company policies without any bad effects from the employer side.

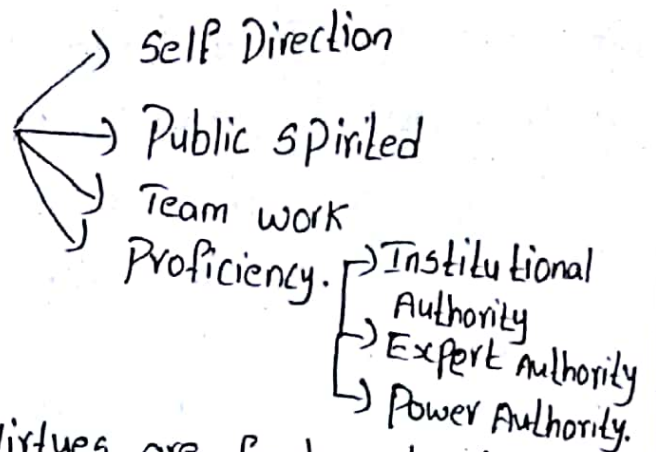
2) Contractual Rights :- Employees contracts created by Organizational Policies. The Rights to receive a salary of a certain amount, right to receive some benefits from the company such as periodic increments in the pay and profit.

3) Non Contractual Employee Rights :- These rights can occur even if not formally recognized in the specific contracts. These rights constitute the right to choose outside activities, right to employer confidentiality, Due Process from employer and sexual harassment at the workplace. ^{salary pending}

④ Professional Responsibility

It covers

4 specific virtues



1) Self direction virtues :- These virtues are fundamental in exercising national autonomy and moral responsibility. self understanding, humility, wisdom, courage, self discipline, self respect and Integrity.

2) Public spirited virtues :- These virtues are Focused Towards the goods of clients and the Public who are affected by one's work. Engineers remove harm to others by Promoting the Public health safety and welfare. Engineers Voluntarily give their time, talent and money to their professional society & local communities.

3) Team work virtues :- Professional to work successfully with other people. They include Collegiality, cooperativeness, ability to communicate effectively and the respect for authorities

4) Proficiency virtues :- It means technical skills. Well prepared to undertake any job assigned. similarly diligence, alertness to dangers, careful attention in performing the tasks, avoiding laziness

Another virtue is Creativity which is specially desirable in our rapidly changing Technological society.

→ Institutional Authority :- Duties are the 2 sides of the same coin. Project engineers have their institutional duty to see that the Projects they supervise are successfully completed.

→ Expert Authority :- The possession of social knowledge, skill or competence to perform the tasks and to give sound advice. The individuals best qualified to serve their institutions goals in a given capacity.

→ Power Authority :- Authority and Power should go hand-in-hand 1) persons who are ineffective may not be able to exercise their power and make employees to be more productive.

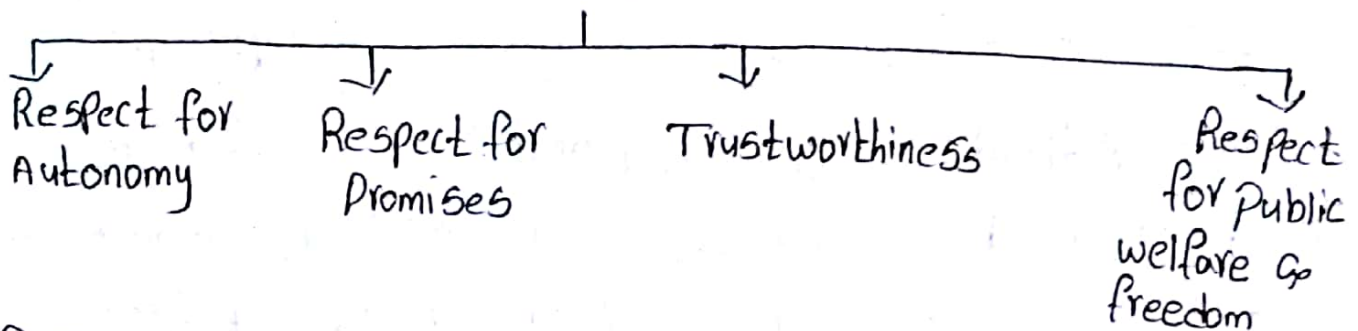
2) Persons who are effective may acquire more power or influence even beyond their positions they hold. They are capable of motivating and encouraging employees under their control.

Confidentiality means keeping the information on the employer and clients as secrets. It is one of the important aspects of teamwork.

Justification for Confidentiality

Employees and Employers have duty to keep up natural trust

Moral Principles



1) Respect for Autonomy !. Respecting the freedom & self determination of individuals and organizations to identify their legitimate control over the Personal Information & themselves

2) Respect for Promises !. Giving respect for the Promises made between the employers and employees.

3) Trustworthiness

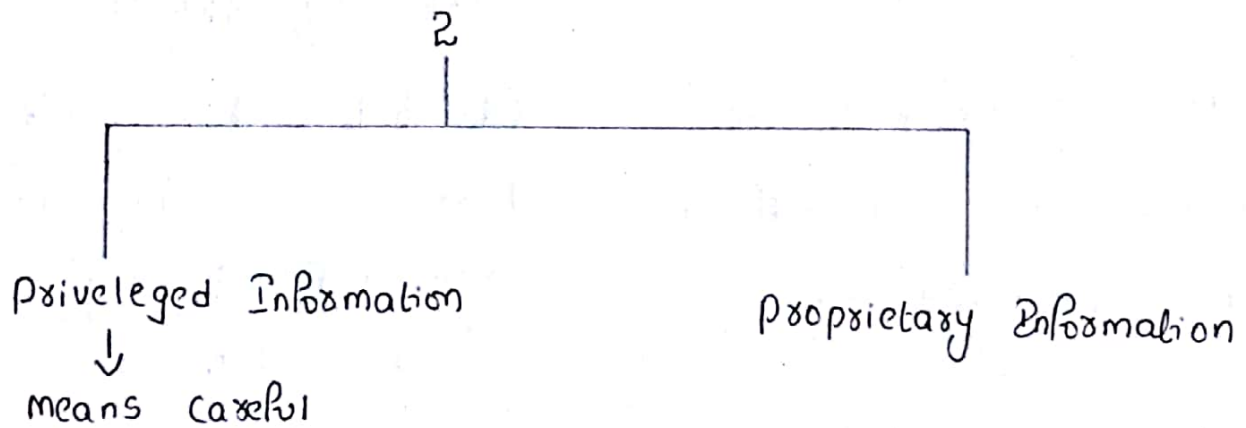
Maintaining Confidentiality by lawyers, accountants and attorneys are necessary to develop confidence and welfare of the individuals and the organizations.

4. Respect for public welfare :-

Identifying relationships in professional transactions for the benefit of public welfare.

Eg:- medical practitioners keep Confidentiality on the problems of Patients, Patients develop Confidence and trust in them.

Types of Confidential information



⇒ It is the information that is available and accessed, by virtue of a privilege.

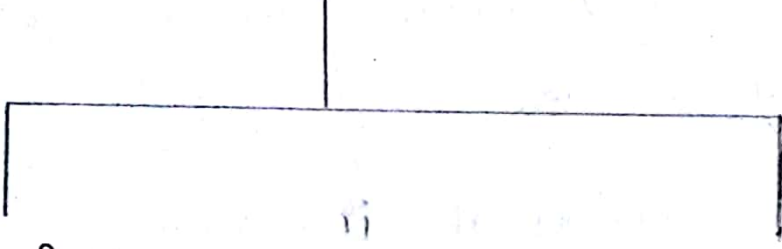
Eg: An Engineer working on defense project may know that the missile he has developed is to be tested against the terrorists across the border.

2. Proprietary Information:-

It is the information owned by the organisation. It is protected legally by the organization from use by others, including the employees. The trade secret is Proprietary Information that has not been made public.

6. Conflict of Interest :-

Solving Conflict problems. A Conflict of Interest occurs when the employee has more than one Interest.



Conflict of Interest

where he has 2 or more desires cannot be fulfilled under the given circumstances

Conflicting Interests

(A Student has to clear 4 Exams he had the time available only 3 Subjects etc).

6. conflict of interest - saving conflict Problems

A conflict of interest occurs when the Employee have more than one interest. A Professional conflict interest is the situation where the Professional have an interest that, if pursued, might prevent him from meeting his obligations to his employees or clients.

Eg: An Electrical Engineer working in the state electricity Board may have a financial interest in a company which supplies electrical instruments the engineer is decide on the bid on the supply of electrical instruments, a clear one conflict interest exists.

→ conflicting of interest: A student have so clear 4 subjects the finds only 3 subjects time available this situation of conflicting interests.

→ Types of conflicts of interest:

↓
Actual conflict of interest

↓
Apparent conflict of interest

↓
Potential conflict of interest

→ Favourable contract

→ Bribe to gift

→ Moon lighting

→ Insider Information.

- (1) Actual: where the objectivity is lost in decision making and the inability to discharge the duty to the employer, it is the result of weak judgement and service.
Eg: civil Engineer.
- (2) Apparent conflict of interest: An engineer is paid based on a percent of the cost of the design and there is incentive for him to cut the costs. In this situation, it appears that the engineer makes the design more expensive in order to get larger commission for him. This situation leads to doubting the engineer's interest and ability for professional judgement.
- (3) Potential conflict of interest: The interest of an employee extends beyond the current employer and into the interest of his spouse, relative or friend. The interest changes into intimate and subconscious non-verbal judgement against the interest of the employer and in favour of the outsider even a potential competitor.
- (a) Favourable contract: when an engineer's spouse is working for a contractor or vendor, a conflict does not arise. But if the engineer is to give a sub-contract to the contractor or purchase order to the supplier the conflict arises.

This happens even the Engineer has Partial or Substantial stock holding in the business of that contractors or suppliers.

(b) Bribe and Gift

Tests	Bribe	Gift
1. Timing	Given before	Given after
2. Lost of item	Large amount	Small amount, articles of daily use.
3. Quality of Product	Poor	Good / high.
4. Given as a friend	Yes	No
5. Transparency	Made in secret	Made in open
6. Motive	Expect undue favour	Expect a favour or thinking for the favour.
7. Consequence on organization's goodwill	Damaging the goodwill & Reputation	No damage is involved.

(c) Moon lighting : It is a situation when a person is working as employee for two different companies in the same time. This is against the right to produce one's legitimate self-interest, it will lead to conflict of interests, if the person works for competitors, suppliers or customers, while working under an employer. That it leaves the person exhausted and harms the job performance in both places.

(d) Insider Information: Another potential conflict of interest is when using inside information to establish a business venture or get an advantage for oneself or one's family or finally the information may be either of the Parent company or its clients.

Conflict of Interest:

1. To serve as a consultant for a competitor's company.
2. Personal interest, such as making private investments in a competitor's company.

Solving conflict Problems:

Conflicts of interest distort good judgement, especially where professionals are involved. Conflicts of interest threaten good judgement in serving an employee.

2 conditions:

1. The Engineer is in a position to ensure good judgement on behalf of the interest of an employee.
2. The Engineer have self interest that will threaten good judgement in meeting the interests of the employee.

⑦ Self Interest , customs and Religion

Self Interest:- It means one's Personal good.

- (2) virtue ethicist emphasizes the importance of self respect, which means looking after one's own need.
- (3) self interest must be balanced by moral responsibility to other people.
- (4) ethical egoism means the main duty of each individual is to maximize his or her own good.
- (5) Ethical egoism differentiation between narrower and wider forms of self interest, one who is selfishly preoccupied with one's own good and neglect the good of others, will generally lose friendship and love.
- (6) friendship and love cares for other people either fully or in part for themselves.
- (7) society benefits more when individuals pursue their private good. corporations or companies get maximum profit in a competitive market self interest is what is good for an individual in the long run.

customs and Ethical Relativism :-

We live in a diverged society in which to levanee for different customs and outlooks are very important.

→ customs all of them need not be accepted by morally concerned persons.

→ customs have great moral significance in guiding us how we should act. we will not challenges that this view is wrong. Instead we think it is true. Moral values are many & flexible.

→ (a) "Ethical Relativism" is simply descriptive relativism which states that belifs about values differ from culture.

(b) " Descriptive Relativism is obviously true, but it is not based on any sound footing.

Ethical Relativism Example 3:

Hitler and his followers murdered millions of Jews and justified that they were correct in doing so, according to ethical relativism, because they believed that their laws, customs and beliefs allow them to do so.

Ethical Relativism was given importance in older days that the moral difference between cultures ought to be respected. That is why people in older days practised like head hunting, human sacrifice etc..

These made them believe that "morality is simply what a culture says it is".

Religion :-

i. Christian influential western countries - hope, faith and love
Islam influential middle east countries.

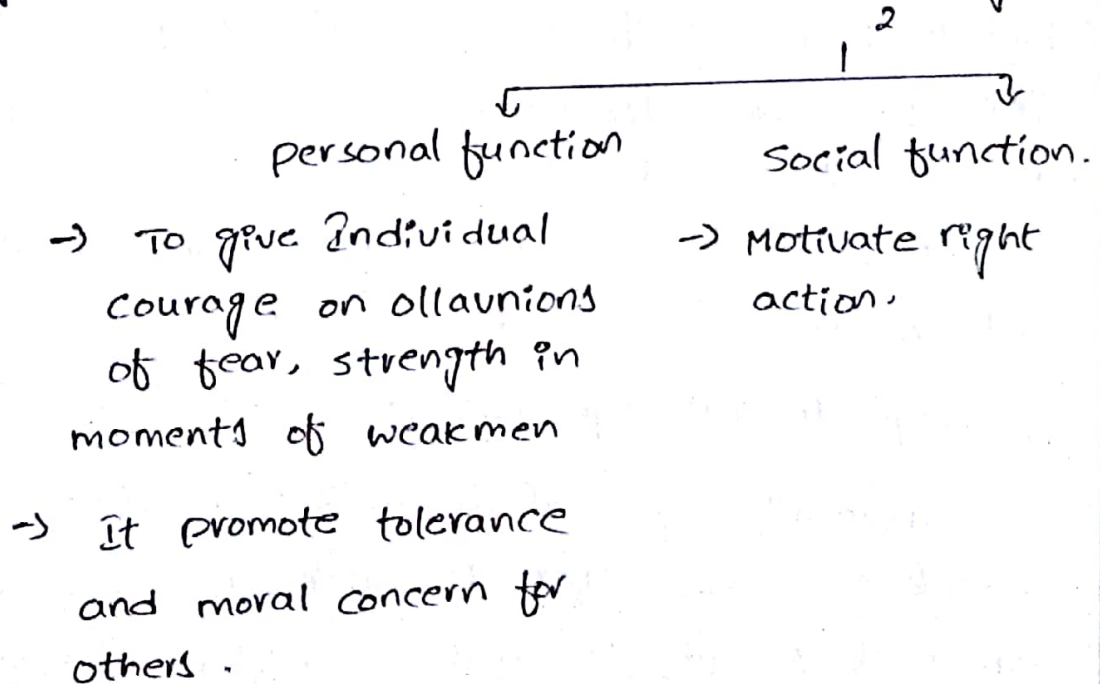
Hinduism and Buddhism influential Asian countries.

↓ ↓

emphasizes emphasizes
ahimsa & love compassion

ii. Many people have psychological connections between their moral beliefs & religious beliefs.

iii. Trust in religion brings an inspiration to be moral. A religion is any set of articles of faith, which is influential in a person making him to perform 2 functions namely



⑧ Ethical Egoism

Ethical egoism, all persons ought to act from their own self-interest. An action or an act is said to be morally right if it maximises one's self-interest. It may apply to things other than acts, such as character traits or rules. If you act for your personal benefit pleasure or greatest good for yourself in an ethical manner this is a case of ethical egoism.

If you consider the interests of others also, then it is a case of altruism.

Eg: I helped my friend out of trouble. This makes me feel happy afterwards. But did I help him to keep myself happy? It could be instantaneous that I jump into action to pull him out of danger and he is saved.

→ Normative claim: Individuals should always act in their own best interest.

→ Psychological egoism:

Humans by nature are motivated if some incentives are offered such as cash award for meeting targets, best employee award for zero casual leaves in a month etc...

COLLECTIVE BARGAINING

collective bargaining is a process of negotiation between Employers and group of employees aimed at reaching agreements that regulate working conditions. The interests of the employees are commonly represented by representatives of a trade union to which the employees belong. The collective agreements reached by these negotiations usually set out wages scales, working hours, training, health & safety.

Employees form an association called "union" in order to protect their rights. Union is a collective agent of employees. It is to safeguard their interests and rights. When the mgmt refuses to fulfill their legitimate rights, employees resort to strike. At this stage, the representatives from both sides discuss the various issues. They ultimately reach a compromise solution acceptable to both sides. This is known as collective Bargaining.

collective bargaining is concerned with the relations between trade unions & mgmt. Bargaining by collective below chosen representation of labour & mgmt acts as bargaining agents.

Features

- Group & collective Action
- strength.
- continuous process.
- flexible
- voluntary
- dynamic
- two party process.

Objectives

- To maintain cordial relations between mgmt & the workers.
- To settle disputes/conflicts relating to working condition.
- To protect the interests of workers through collective action.
- To resolve participation of trade unions.
- To resolve the differences between workers & mgmt.

Principles of collective Bargaining:

→ Principles for trade unions

- (a) they should have open mind on various issues.
- (b) there should not be any room for confusion & misunderstanding.
- (c) trade unions should fully support mgmt.

→ Principles for management:

- (a) mgmt should give proper recognition to trade unions.
- (b) Rules governing labour should be periodically examined.

(*) Principles for both union & mgmt:-

- (1) Both the parties should have faith on each other.
- (2) Both the parties should have positive view of whole problem rather thinking it as formality.

Levels of collective Bargaining

- At plant level.
- At industry level.
- At national level.

Types of collective Bargaining:-

- Distribution Bargaining:- In this one party's gain is another party's loss.
- Integrative Bargaining:- In this both the parties may gain or atleast neither party loses.

Process of collective Bargaining

- Identification of problem.
- Preparation of negotiation
- Negotiation Procedure.
- Implementation of contract.

Functions

→ long run social change → peace treaty

Essentials of successful collective Bargaining:

- favourable political climate
- strong & stable unions.
- Recognition
- willingness to give & take.
- positive Attitude.

Confidentiality:

It means keeping the information on the employer and clients on secrets. It is one of the important aspects of teamwork. Keeping confidences is the most important duty of any professional.

1. Lawyer must keep client's information confidential.
2. Doctors " " Patient's " "
3. Teachers " " Students personal information "
4. Self employed Engineers must keep information about their company & clients confidential.

Definition:

Confidential information which is desirable to keep secret in a govt dept. Engineers and the employees are expected to keep information "confidential" they are expected not to leak out any confidential information to unauthorized people both inside and outside the company.

Any information which is to be kept as "confidential" if it is known to others it will cause harm to the corporation or the clients. Any information to keep secret in order to compete effectively against business rivals. It

known as confidential informed.

Justification for confidentiality:

1. Respect for Promises.
2. Trustworthiness.

Types:

1. Privileged Information: It means the information that will be available only on the basis of special privilege. Special privilege means the privilege accorded to an employee working on a special assignment. It covers information that has not yet become public or widely known within an organisation.
2. Proprietary Information:

IS an information that a company owns if it is the information owned by the proprietors in a legal sense. This means means "property" or "ownership".

Acceptance of Bribes / Gifts - when is a Gift
and a bribe - Examples of Gifts v/s Bribes.

Refer Pg No: 8 (Back pages of this unit)

Continuation:-

Companies give gifts to employees of govt agencies or partners in trade many such gifts are un objectionable, some are similar to bribes. Bribes are illegal or immoral because, they are capable of threatening fairness in competitive situations.

Since bribes can bias judgements, companies have given elaborate guidelines for their employees, illustrating acceptable and unacceptable gifts. But in some company officials are prohibited by law from accepting anything of value.

Engineers should not accept money directly or indirectly from contractors, their agents in connection with the work. If one receives any gifts which will cause an embarrassing consequence for the company when made public, then the gift is considered as a bribe. Entertainment, travel and other social functions give rise to special difficulties, many companies encourage their employees to form social relationships with the suppliers and the clients, in order to enhance their business interest. This is also another form of bribery...

problem & Solving

Engineering is the creative application of scientific principles to design or develop structures, machines, manufacturing; or to construct or operate the same with full cognizance of their design, or to predict their behaviour under specific operating conditions.

Engineers find solutions for given problems applying mathematics & science such as physics and also improve the problems or to make improvements to the states.

The major challenge of an engineer is to identify, understand, and interpret the constraints on design in order to produce a successful result. A project or product needs to be technically designed and also should be capable of delivering the desired results, and the role of engineer in this process is unique & challenging.

Problem solving assumes high degree of priority. The professionals such as engineers need to work under constraints in terms of limited resources, physical imaginative, flexibility for future...

modification and additions, and other factors in cost, safety, marketability, production and serviceability.

Engineers use their knowledge of Science, mathematics, logic, economics and appropriate experience or tacit knowledge to find suitable solutions to a problem. Creating an appropriate mathematical model of a problem allows them to analyze it.

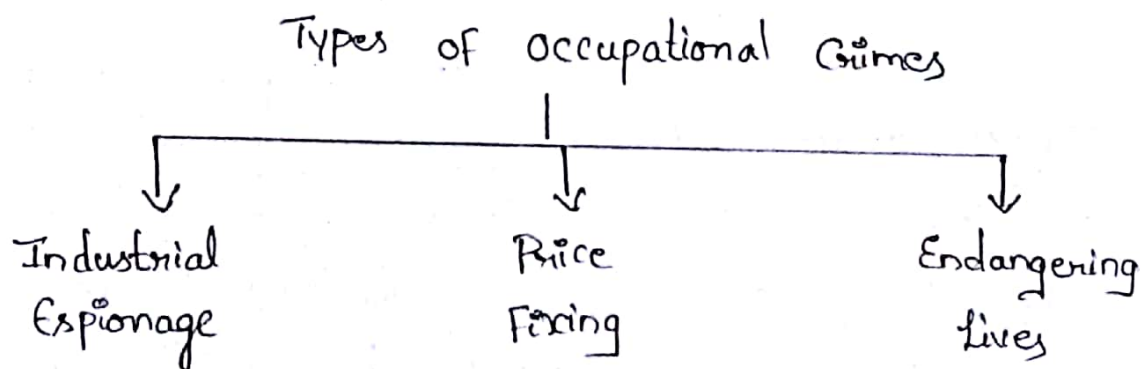
- (a) Predicting how well the given design will perform
- (b) How to design a product or service to ensure that it does a good job & does not harm the users or public
- (c) Evaluating the designs in the light of real conditions
- (d) Computers are extensively used in problem solving by the professionals.

14. Interests in other Companies

Engineers should not work as Consultants for a competitor or a subcontractor of his own company. They should not provide for allocating jobs to the other companies even if their relatives/spouses are employed during partial ownership or holding shares in the competitive company will lead to conflicts due to personal interests working in one's spare time for a competitor will hinder the current employer's business but will not have any effect if moonlighting is carried out in other business which is not connected to the current employer.

Occupational Crimes are the illegal activities in one's Company or an Organisation. It is the violation of laws regulating the work activities. When workers & professionals are committed, occupational crime is called "White-collar Crime". Many occupational crimes fail to meet professional obligations. Occupational crime sometimes promotes the interest of one's employer rather than oneself. Occupational crime deserves attention because it frequently takes place in a greater magnitude. Also it invites the attention of the public.

A theft by an employee is a type of occupational crime during the time of employee's assigned tasks. Leaking out certain trade secrets to other companies is also an occupational crime.



Industrial Espionage:

It means betraying one's own company to other companies for his own benefits or gains.

For eg. The army secrets of our own country and atomic energy secret were once sold to Pakistan.

Employees who betray the company secrets need not be criminals, An Employee even without being a criminal may buy trade secrets from one company and sell them to another company.

* Police fixing :-

fixing the bidding rate by company, in collusion with other companies, especially for the contract / services is called police fixing. This is an occupational crime, prevalent in electrical equipments industries, where there used to be a few contracts but large number of contracts. Because of this, public but large as well as the govt incur huge loss. Two top officers of westing house and GE, USA who were involved in police fixing without the knowledge of their directors, were sentenced to imprisonment a few years back. These officers held that it was legal to fix police and even argued that this procedure is really beneficial to the people. However, the court did not accept this view.

Endangering lives :-

Employers who expose their employees to safety hazards escape criminal penalties, but the victims will sue the companies in compensation under civil law.

workers are prone to diseases like heart diseases, lung diseases, eye problems when they happen to work in Chemical Industries, Cement Industrial, asbestos industrial and soon. When the employees are appointed in the company, the Employer is expected to brief them about the environmental hazards, they have to face at the time of their works, In case employee are affected by any of the diseases as said above they are eligible for Compensation in the form of monetary benefits.

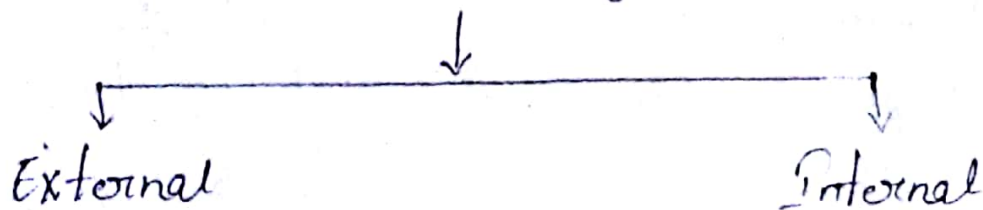
Not briefing about Environmental hazards and not paying compensation for victims are considered to be occupational crimes.

To protect the employees from safety hazards, they are to be provided with boots, rubber gloves, aprons, helmets, respirators, and proper ventilation, including free medical & transport facilities.

Whistle Blowing
Engineer's Conveying Information by an Employee, on an important moral problem to somebody in a position to take action on the problem. Further, this is done outside the approved organization channels.

"whistle - Blowing" means when an Employee or former Employee Conveys an Information about a moral problem to the authority to take action on the problem. Alerting the authority a moral problem to take action on the problem, in the interest of the company is known as "whistle - blowing".

Types of whistle Blowing



Passing on Information outside the organization

Passing on Information to someone with in the organization but outside the approved channels.

when should it be attempted :-

- Procedure to be followed before whistle Blowing:-
- Except for Extreme emergencies, always try working through normal organizational channels.
- Proceed in a tactful manner
- As much as possible, keep superiors informed of your actions.
- Be accurate in observations and claims and keep all formal records.
- Consult colleagues for advice.
- consult a lawyer's regarding potential legal liabilities.
- use polite & tactful language.

Conditions :-

1. The harm that will be done by the product to the public is serious and considerable.
2. The individual makes his concern known to his superiors.
3. one must have strong evidence that making the information public will in fact prevent the threatened serious harm.

Prevention of whistle Blowing :-

1. Giving direct access to higher levels of management by announcing 'open door' policies with guarantee.
2. This gives greater freedom & promotion open communication within the organization.
3. Creation of an Ethics Review Committee with freedom to investigate complaints and make independent recommendations to top management.
4. Top Priority should be given to promote ethical conduct in the organization by the top management.
5. Engineers should be allowed to disum in Confidence, this moral concerns with the Ethics Committee of their professional societies.
6. Changes & updating in law ~~maner~~ must be Explored by Engineers, organizations, professional societies & govt organizations on a continuous basis.

— * The end * —

GLOBAL ISSUES

- * Globalization
- * cross culture Issues
- * Environmental Ethics
- * computer Ethics
- * computers as the instrument of unethical behaviour
- * computers as the object of unethical acts
- * Autonomus computers
- * computer codes of Ethics
- * Weapons Development
- * Ethics and Reasearch
- * Analysing Ethical problems in Research
- * Intellectual property rights

Globalization

Globalization means integration of countries through commerce transfer of technology, and exchange of information and culture. In a way, it includes acting together and interacting economies 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 international organizations, computer, internet functions, military development and environmental ethics have assumed greater importance for their very sustenance and progress.

We as producers and consumers, live in a globally competitive world. Even politically we are interlinked with people around the world. Presently and in future, our economic condition, national security, and human existence are all interrelated with other nations.

When a multinational corporation of one country sets up companies or industries in other countries, various problems are faced by a host country. This makes the host country to be more concerned about global issues like environmental hazards, poor wages, discrimination, violation of human rights and so on.

The word "Global" means international concept of engineering applications, with social and environmental dimensions of engineers' work. The various global issues are

1. Multinational Corporations
2. Environmental Ethics
3. Computer Ethics
4. Weapons Development.

Though engineers are professionals since they are employed in an industry, they have to play the role of managers

so as to satisfy employees, customers, dealers and the general public. Engineers are also to act as expert witnesses, in the Court of law, when conflict arises between an employee and an employer. Also, engineers are to conduct themselves as moral leaders in their professional fields.

Last but not the least, engineers are bound to promote and practice the profession of engineering for the common good of community. professional bodies like Institution of Engineers, India - IE (I), Institution of Electronics and Telecommunication Engineers - (IETE), India, etc., have drafted "code of ethics" to guide engineers in the proper direction while promoting public good.

Cross Cultural Issues

Globalization involves movement of people across regions and this influences their culture, their food habits, their living style and the way they treat others and they in turn impact others also. It requires great deal of understanding and patience to understand and internalize the alien culture. Some times when such understanding is lacking, it may result in cross cultural shock also. Multinational companies employ diverse nationals and every such organization becomes a hub for cross cultural issues. Orientation is provided to employees facilitating them to adjust to cross cultural differences when they need to visit foreign countries for business purposes.

It has become one of the major goals of every employer or academic institution, if they have foreign nationals from different countries to train them intellectually resilient, cross culturally and scientifically literate, technologically adept, ethically anchored and fully prepared for a future of continuous and cross-disciplinary learning. One of the key challenges of 21st Century is to train the ability to deal with serious worldwide problems as a global citizen. As a result of globalization, the focus on cross cultural issues is on rise.

Culture Stress Versus Cultural Shock; Getting involved, understanding the value system, learning the language, speaking to the natives and using non-verbal communication, tuning to the temperament of the natives, working with multinational teams are some of the strategies that will address the problem of cultural stress. Culture stress is part of culture shock which could be fairly of longer period. Culture shock arises when there is confusion, disorientation or lack of control in the new environment.

Cross Cultural Issues; Cultural issues vary from country to country. One should get oriented to the culture of that land before one enters. How do you receive, how do you make one comfortable, how do you conduct business dealing or social activity, how you maintain contacts, how you make the other comfortable, how you take care of your members in the team, how you

respect the other person - all these become integral part of one's cultural intelligence. The following are some of the prominent cultural issues across different cultures.

- a) Signals of respect
- b) Structure of organisations
- c) Positions of power
- d) Clothing for different contexts
- e) Socializing across cultures and work based relationships through
Extending invitations. Mixing social interaction with business. Appropriate behaviour for hosts and guests. Gift giving. Dealing with controversy in social situations, Holiday greetings.
- f) Power distance and Communication.
- g) Cultural impact on social relationships.
- h) Cultural intelligence
- i) Language and tone of communication/authority.
- j) Titles used (to communicate power distance for instance, In Oman: Sheikh, imam, and of course, Sultan; and in Germanic and Indian cultures: professional titles, such as Dr. Professor.)
- k) The food habits (eg. Chinese and Japanese finish their supper before sunset. Americans prefer late supper Chinese hotels do not accept any tip when you pay the bill after lunch/dinner)
- l) Recognition for performance.
- m) Relationship building
- n) Gifts (In Denmark, gifts are not expected at business meeting unlike in other countries such as in India, Japan, Czech Republic, Bolivia, China etc.)

Environmental Ethics:

Increase in the number of automobiles on roads, chemical industries, tanneries, unlimited use of plastics cause a greater damage on environment. Such damages even spread across the continents.

As human beings we share a common environment, a common environment, a common ecosphere. Protection of the environment globally should become a united commitment across national boundaries. Hence a new branch of applied ethics called "Environmental Ethics" has been developed which aims at total environmental protection.

We are misusing our scarce resources, fouling our environment. In general, the increase in consumption of limited resources and exploding population will ultimately make our "Spaceship Earth" very small for us.

Engineers are to be aware of their role in protecting the environment for the present and future generations.

Case Studies:

The disaster at Bhopal and Chernobyl Nuclear Plant explosion, have caused long term environmental effects. It is difficult to assess long-term changes in the climate due to the "green house effect" and "depletion of Ozone layer".

Example:

The following are a few examples that cause environmental pollution and hazards.

1. Acid Rain
2. Air and water pollution
3. Asbestos Industries
4. Land Subsidence due to over de-watering

Acid Rain:

The atmospheric air is damaged by acid rain and acid deposition. It also pollutes the surface water and hence the ground water.

Normal rain water has a pH value but the typical rain water in the North Eastern areas of North America has a pH value of 3.9 to 4.3. This is 10 to 100 times more acidic than the normal.

The result is "Acid Shock". This causes mass killings of fish. Acid rain harms fish-eggs and food sources. Aluminium, Zinc and many other metals that contain in acid rain water reach the streams and lakes. Due to this the ground water is polluted. Also the seacoaster is polluted. Forests have also been steadily destroyed, animals have suffered decrease in population and farm lands are damaged. Drinking water sources are also being damaged due to acid rain.

The mechanisms involved in the process of acid rains:

Air and water Pollution:

The rapid industrial growth all over the world has affected the environment, air and water to a greater extent. People living in cities are to undergo severe air pollution and water pollution. The discharge of effluents with toxic contents in streams and rivers.

Without treatment has polluted not only the surface water but also the ground water. Increase in the number of chemical industries, the exhaust fumes from such industries pollute the air due to the contents like CO_2 , CO , SO_2 and so on. United States of America, Japan, are such countries which suffer from air and water pollution to a greater extent.

In India, metropolitan cities like New Delhi, Mumbai, Kolkata, Chennai and Hyderabad are few cities which are severely affected by air and water pollution.

The untreated effluents from dying industries at Thiruppur, were let out into Noyyal river. The river water has been polluted to such an extent that it can not be used either for agriculture or for drinking purpose. Groundwater along the river banks downstream of Thiruppur has also been polluted.

Tanneries at Dindigul, discharged the untreated tannery effluent on open land and due to this, groundwater in this area has been polluted. water has become unpotable.

In order to save surface water and groundwater in the above said areas, Govt has formulated stringent laws. According to this law, no industry can let out the effluent untreated. If any industry violates this law, the licence will be cancelled. The implementation of these laws are being monitored by "Tamil Nadu pollution Control Board".

Pollution Due to Asbestos Industries : Asbestos industries pollute the atmospheric air and cause lung disease, Cancer and breathing problems.

Land Subsidence :

Over pumping of oil and water from the ground will result in land Subsidence. As a result roads will crack, rail roads will buckle. Sewer lines may burst. Such things happened in Tokyo, Osaka in Japan, covering about 8000 square kilometers area. To prevent such land subsidence water was injected under high pressure into the ground.

The above examples show how human activities can change our environment in many different ways. To prevent the environmental pollution globally, international laws and regulations are to be framed and implemented strictly to save our mother earth from environmental hazards.

Computer Ethics :

Computer have become inseparable combinations of our technological society. Through networks they connect the globe.

It is clear that computers cause a variety of moral problems. To deal with these problems, a new area of ethics called "Computer Ethics" has come up. Computer ethics has special importance for professionals emerging with computer technology.

The various computer professionals are designers of computer,

Programmers, Systems analysts and operators.

Computer ethics is a branch of engineering ethics. Many professionals who use and control computers, share the responsibility for computer applications.

Issues in computer ethics are ;

1. Power Relationships
2. Poverty
3. Invasions of Privacy.

All these issues may involve "Computer abuse", that is, unethical or illegal conduct in which computers play a central role.

Power - Relationships

During 1960's there was some sense of fear that introduction of computers may lead to "concentration" and "Centralization" of powers in the governmental and non-governmental agencies. It is earlier thought that only selective people (bureaucrats) can have access to the use of large computers. The subsequent use of "Microcomputers" at cheaper prices, erased the fear of centralization of powers and created a decentralization of powers.

Computers as powerful tools cause moral issues in Society. Below are a few examples.

1. Loss of more jobs by termination of employees.
2. Strained customer relations, because of "Computer Printed errors"

3. Biased software programmes.
4. Stock trading manipulation in buying and selling the shares
5. Unrealistic expectations because of the monopoly of Computer sales people.
6. Political power gaining by politicians.
7. Dangerous, Computerized defence systems, even if they are working perfectly.

Property;

The other issues about property and computers are

1. Use of Computers in embezzlement.
2. Stealing money and financial assets
3. Data and Software Stealing.

1. Embezzlement;

- (a) Disguising one's voice by means of computer as he talks into a phone.
- (b) Getting access to internet by using the phone number of someone else's without his knowledge.

Sometimes Secret Computer passwords have been used as a Security measure.

2. Stealing Money;

When the communication lines linking the computers, cross national boundaries, stealing by employees at work, non-employees, and consumers, take place.

3. Data and Software Stealing;

"Data" refers to an information stored in a computer, "Software"

Refers to the programmes that direct electronic machine (hardware) to perform certain tasks, involving solving Problems. Programmes have several aspects.

- (a) An algorithm - Steps in solving problems.
- (b) A Source code - Express the algorithm in a general computer language such as C, C++ and Java, VB etc.,
- (c) An object code - Translates a Source code into the specific machine language of ones and zeros.

Property is anything they create through their labour. Also property is one what laws define as the permissible use of things.

In the United States, computer hardware is protected by patent laws. Software can be protected by Copyright and trade Secret laws. Copying clearly denies the creators and producers of the programmes, the money to which they are entitled. This is a form of theft.

Privacy :

Storage, retrieval and transmission of information using the Computers as data processors pose moral threats to the right called "privacy" By making more data available to more people with more ease, Computers make privacy more difficult to protect.

Hackers:

"Hackers" are those who challenge any Computer Security system. Some in - plant "time bombs" (unwanted codes that

copy themselves into larger programmes). This will choke networks with dead-end tasks, erase files and even destroy equipment. This action is a clear violation of property rights. Privacy in a Computerized world can be protected only by making it inconvenient and expensive for others. To collect information about us, from data banks, is also a violation of "Privacy" in Computer's.

Professional issues;

Many issues in engineering ethics arise under the context of Computer work. New difficulties are involved due to high degree of job complexity and required technical proficiency introduced by Computers. Some examples are as follows.

1. Computer failures - Due to error in hardware or software
2. Computer implementation - Change over to a new Computer System should never be attended without having the old system still operational.
3. Health conditions.

Engineers who supervise Computer personnel should check that health considerations are taken care of to reduce back problems. Provisions are to be made for wrist support and good keyboard layouts. Good lighting and ventilation should all so be provided.

Computers as the instrument of unethical behaviour and Computers as the object of unethical Acts.

Computers have become an integral part of human life. The Computers are used for right purpose as much as they are used for wrong purposes or abused. The Computers are Versatile, hence drawing line between criminal and non-criminal acts regarding its use is difficult. There are several enactments that make the following criminal acts punishable under Indian Penal Code.

Some of the abuses can be listed as given below:

- a) Financial data manipulation behaviour leading to embezzlement of cash.
- b) Computer worms and viruses and widespread computer hacking and unauthorised intrusions.
- c) To obtain unauthorised information from networks of government agencies and departments, as well as data relating to national defence or foreign relations.
- d) Hostile acts by terrorist organisations.
- e) Software piracy and Computer fraud.
- f) Internal Computer destructive crimes (Acts in which one computer program interferes with another computer thus hindering its use, damaging data and programs causing the other computer crash or inoperative)

Code of Ethics for IT Professionals ;

1. A professional member of the Computer Society of India (CSI) shall :-

- * Organise the resources available to him and optimise these in attaining the objectives of his organisation.
- * Use the Codes of practice conveyed by the CSI from time to time in carrying out his tasks.
- * Not misuse his authority of office for personal gains.
- * Comply with the Indian law relating to the Management of his organisation particularly with regard to Privacy and Piracy, and operate within the spirit of these laws.
- * Conduct his affairs so as to uphold project and further the image and reputation of the CSI.
- * maintain integrity in research and publications.

Codes of Practice ;

2. As regard his Organisation an IT professional should ;

- * Act with integrity in carrying out the lawful policy and instructions of his organisation and uphold its image and reputation.
- * plan, establish and review objectives and tasks for himself and his subordinates which are compatible with the codes of practice of other professionals in the enterprise, and direct all available effort towards the Success of the enterprise rather than of himself.
- * fully respect the confidential information which comes to him

- g) Spreading Computer viruses through unsolicited e-mails.
- h) Mailing worms or viruses (independent programs that create temporary files and replicate themselves to the point Computers grow heavy with data, become sluggish and then crash)
- i) Instructing remote Computers to bombard one's servers with automated requests for service.
- j) Attacks on internet architecture.
- k) Illegally obtaining Computer passwords, possessing unauthorized access devices (long distance calling-card numbers), and committing wire fraud in violation of the Computer Fraud and Abuse Act.
- l) Using Computers to view pornography.

All the above cases have been the most prominent ways of using Computer for unethical behaviour or acts and the legal provisions in every country today are very sharp and the police machinery also is totally strengthened with a separate cyber crime department. If the Computer is used to take or alter data, or to gain unlawful use of Computers or services, it is viewed as Computer Crime and is a punishable crime. It is necessary that technology for law enforcement must be ahead of the technology used by the hackers.

in the course of his duties, and not use confidential information for personal gain or in a manner which may be detrimental to his organisation or his clients.

- * Not snoop around in other people's computer files.
- * In his contacts and dealings with other people, demonstrate his personal integrity and humanity and when called to give an opinion in his professional capacity shall to the best of his ability, give an opinion that is objective and reliable.

3. As regards the Employees, an IT professional should:

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

4. As regards the Clients, an IT professional should:

- * ensure that the terms of all contracts and terms of business be stated clearly and unambiguously and honoured
- * Not use the computer to harm other people or to bear false witness.
- * be objective and impartial when giving independent advice.

5. As regards the Community, an IT professional should;

- * Make the most effective use of all natural resource employed.
- * be ready to give professional assistance in community affairs
- * Not appropriate other people's intellectual output,
- * always use a Computer in ways that ensure consideration and respect for fellow human.

Any Violation will be viewed very seriously and disciplinary action and including withdrawal of membership will be initiated as per the norms of CSI

Autonomous Computers

There is enormous complexity in the overall computer network which is hard to control manually by human operators.

Manual Control is time-consuming, expensive, and error-prone and needs to control a growing networked computer-system. 80% of such problems in infrastructure, for instance, happen at the client specific application and database layer.

Autonomous systems offer a possible solution that could be to enable modern networked computing systems to manage themselves without direct human intervention. It is inspired by the autonomic nervous system of the human body. This nervous system controls important bodily function (eg respiration, heart rate, and blood pressure) without any conscious intervention.

In a self-manage autonomous system, the human operator takes on a new role: instead of controlling the system directly he/she defines general policies and rules that guide the self-management process. The four functional areas underlying this process are.

- a) Self-configuration Automatic configuration of components
- b) Self-healing Automatic discovery and correction of faults.
- c) Self-optimization Automatic monitoring and control of resources to ensure the optimal functioning with respect to the defined requirements.
- d) Self-Protection Proactive identification and protection from arbitrary attacks.

Characteristics Even though the purpose and thus the behaviour of autonomic systems vary from system to system every autonomous system should be able to exhibit a minimum set of properties comprising a) automatic b) adaptive and c) aware, to achieve its purpose.

Autonomous computing refers to the self-managing characteristics of distributed computing resources. It adapts to unpredictable changes while hiding intrinsic complexity to operators and users. Autonomous system aims

- i) to develop computer systems capable of self-management.
- ii) to overcome the rapidly growing complexity of computing

Systems management, and its complexity poses to further growth.

Weapons Development

The world's technological activity has immense impact on weapons development. The military technology is discussed here. The moral issue because of engineers participation in military technology has no comparison. "Cold war" and the risks of "nuclear war" are the effects of weapons development. High technology, weaponry, terrorism, and drugs are confronting issues between super power nations like USA, Russia, France and China.

There are several reasons for an engineer to do his or her best on a military job. Patriotism and interest are the two main reasons for one's best on a military job.

There are several reasons for an engineer to refuse war work. Engineers are under ethical obligations to erect bridges that do not collapse. They have to build nuclear power plants that do not emit radiation. The other view is to see weapons development as a defensive measure against greater destruction by opponents.

The Weapons Sca- Saw

The trade in arms and military know-how have a long tradition of military expenditures through out the world

comes about hundreds of billions of rupees annually. of this amount, about 25% is allotted for purchase of weapons and related equipment.

20% of the amount is spent on international trade on weapons. The most world's successful arms merchants and manufacturers are Krupp Company - Germany, Vickers - UK, Schneider - France. They supply arms to the China, Japan and Russia and Pakistan.

In the world war I and world war II destructive arms like tanks, air crafts, rockets and nuclear weapons were used. It caused the greatest damage to the human lives and properties, which the world can never forget.

The atom bombs dropped on Hiroshima and Nagasaki are horrible because of larger number of deaths and many got permanently injured.

Engineers involvement in Weapons:

The involvement of engineers in the manufacture of weapons are as follows.

1. Manufacture of "anti personal bombs".

The bombs can be timed to explode hours after delivery. The fragments are made of steel, which will cause deep injuries.

2. A "Napalm" is manufactured by a chemical engineer. This is the most brutal and destructive weapons that has ever been created. This was used during the Vietnam War.

3. Missile control and guidance are also done by an engineer in the army field. This type of missiles will carry single or multiple warheads with a kind of dreadful fire power which will keep the enemy under check.
4. An engineer qualified in physical electronics and laser beams did research in "Particle beams". He developed something similar to the "death ray".
5. An electronics engineer developed "avionics" for fighter planes.
6. An engineering physics qualified engineer developed "Nuclear bomb" though we know and fully aware the serious consequences of a war, the entire world. It will not be a wonder if we say that weapons work is humankind's most crucial.

Finally let us ask ourselves how long a nation can divert tremendous resources, that is funds, materials, talent, affecting nation's economy. Every rupee spent on defense products results in reduction of number of jobs. Other important sectors such as education, roads, water supply, sewage disposal and poverty reduction are neglected.

Ethics And Research

Ethical norms are so universal and research is not an exception. To promote the aims of research (i.e., knowledge, truth and avoidance of error), ethical norms are to be adhered. Every research organisation promoting research lays out clear

cut guidelines to prevent fabricating, falsifying or misrepresentation research data and this promotes the truth and avoid error. Research involves a great deal of cooperation and coordination among many different people in different disciplines and institutions and hence ethical standards promote the values such as trust, accountability, mutual respect, and fairness) that are essential for collaborative work. There are many ethical norms in research, such as guidelines for authorship, copyright and patenting policies, data sharing policies, and confidentiality rules in peer review and all these are designed to protect intellectual property interests while encouraging collaboration.

No researcher wants to have his ideas stolen or disclosed prematurely. He would like to have the credit for his original work. Ethical norms in research help to ensure that researchers can be held accountable to the public for their research observations. Government policies on research misconduct, conflicts of interest, the human subjects protections and animal care and use are well defined to make sure that researchers who are funded by public money can be held accountable to the public.

Trigger for Thought

Take the case of oil companies. For instance, Bharat Petroleum Corporation Limited (BPCL) 'Energising Lives'

Vision at BPCL;

- We are the most admired global energy company.
 - We are the first choice of customers, always.
 - We are the role model for Health, Safety, Security and Environment
 - We are a great organisation to work for
 - We are a learning organisation
 - We are a model corporate entity with Social responsibility
- Corporate Values at BPCL
- Innovative
 - Caring
 - Reliable.

Ethical norms in research promote public support for research. More funding can flow if research works can generate trust, quality and integrity. Many of the research norms promote a variety of other important moral and social values such as social responsibility, human rights, animal welfare, compliance with the law, and health and safety. Any violation of such norms can significantly harm human and animal subjects, students, and the public.

For instance, a researcher who violates the regulations and guidelines relating to radiation or biological safety may jeopardize his health and safety or the health and safety of staff and students. The professional bodies and other research organizations ensure that they promote the following through their research efforts.

Analysing Ethical problems in Research

- a) **Honesty**: The researcher has to i) Strive for honesty in all Scientific Communications ii) honestly report data, results, methods and procedures, and publication status. iii) does not fabricate, falsify or misrepresent data iv) does not deceive colleagues granting agencies, or the public.
- b) **Objectivity**: The researcher has to i) strive to avoid bias in experimental design, data analysis, data interpretation, peer review, personnel decisions ii) avoid or minimize bias or self-deception iii) disclose personal or financial interests that may affect research.
- c) **Integrity**: The researcher has to keep your promises and agreements; act with sincerity strive for consistency of thought and action.
- d) **Diligence**: The researcher has to i) Avoid Careless errors and negligence ii) carefully and critically examine your own work and the work of your peers iii) keep good records of research activities.
- e) **Openness**: The researcher has to i) Share data, results, ideas, tools, resources and ii) be open to criticism and new ideas.
- f) **Respect for Intellectual property**: The researcher has to i) Honor patents, copyrights, and other forms of intellectual property ii) Secure permission before using unpublished data, methods. iii) give credit where credit is due iv) Give proper acknowledgement v) avoid plagiarism at any cost.
- g) **Confidentiality**: The researcher has to protect confidential

Communications, personal records, patient records

- h) Responsible Publication: The researcher has to publish in order to advance research and scholarship
- i) Respect for colleagues: The researcher has to respect your colleagues and treat them fairly.
- j) Responsible Mentoring: Researcher has to help to i) educate, mentor, and advise students ii) promote their welfare and allow them to make their own decisions.
- k) Legality The researcher has to i) maintain know and obey relevant laws, institutional and governmental policies.
- l) Animal Care: The researcher has to i) show proper respect and care for animals used in research ii) avoid unnecessary or poorly designed animal experiments.
- m) Human Subjects Protection: The researcher has to i) minimize harms and risks and maximize benefits on human subjects under research ii) Respect human dignity, privacy and autonomy.
- iii) Take special precautions with vulnerable populations; and
- iv) Strive to distribute the benefits and burdens of research fairly
- n) Social responsibility: The researcher has to i) Strive to promote social good and ii) prevent or mitigate social harms through research, public education, and advocacy.
- o) Non discrimination: The researcher has to i) avoid discrimination against colleagues or students on the basis of sex, race, ethnicity
- p) Competence: The researcher has to i) take steps to promote competence in science as a whole.

Intellectual property rights:-

Intellectual property:-

An idea, a design, a manuscript, an invention, or a concept which will give rise to a useful product/application, is known as an "Intellectual property".

The inventor of an intellectual property likes to have a reasonable reward for his invention. The problem with an intellectual property is that it can be copied, imitated or reproduced. This reduces the returns to the inventor. The inventor has the right to derive monetary benefits from his invention, that is, intellectual property. This right is known as intellectual property Right (IPR). The IPR is also recognized by the government so long as it is not detrimental to the society.

Protection of Intellectual property Rights:-

Intellectual property rights may be protected by several forms. Each form of protection has its own advantages and disadvantages. The various forms of IPR protection are as follows:

1. Trade secrets
2. patents
3. copyright

Trade Secrets :-

When an individual or an organization owns an intellectual property, does not disclose the property to any one and keeps it as a "Secret" to safeguard his business interests, is called "Trade Secret".

Advantages :-

- i. Duration is unlimited for trade secrets.
- ii. The cost of filing, contesting and enforcing patents are saved.
- iii. Someone cannot easily improve upon the product or process. Thus the risk is reduced.
- iv. There is no need for protection under, say patents.

Disadvantages :-

- i. Maintaining a trade secret is a costly affair.
- ii. It is not protected from independent innovation or invention.
- iii. Trade secret cannot be applied to many inventions like equipment design, books, trade secret of Coca Cola, etc.

The right granted by government to an inventor to prevent others from imitating, manufacturing, using or selling his invention for commercial use during a specified period, is known as "patent" or "patent Right".

patent Right:-

patents are granted for

1. An invention (including a product)
2. Innovation or improvement in an invention.
3. The process of a product.
4. A concept.

Limits of a patent:-

1. Time limit - A patent is valid for a specified period of time from the date of award, in most countries this period is 15 to 20 years.
2. Space limit:- A patent is valid only in the country where it is awarded. It is not valid in other countries.

certain intellectual properties are not patentable. They are protected by "copyright". The copyright is limited both in time and extent. Copyright provides protection for a specified period from reproduction of materials either in full or in part. It, however, does not prevent another person from using either the idea or the information contained in a copyright material. The Indian copyright laws are at par with International Standards.

Benefits of IPR:-

- (i) IPR encourages and protects intellectual creation.
- (ii) It motivates investment in Research and Development (R&D) activities.
- (iii) consumers are directly benefited with the results of inventions.
- (iv) It spreads new ideas and technology quickly and widely.

ENGINEERS' RESPONSIBILITY for Safety And RISK

Safety and Risk, Concept of Safety - Types of Risks - Voluntary v/s involuntary Risk - Short term v/s Long term consequences - Expected probability - Reversible Effects - Threshold levels for Risk - Delayed v/s Immediate Risk - Safety and the Engineer - Designing for safety - Risk - Benefit Analysis - Accidents

Safety and Risk:

Safety was defined as the risk that is known and judged as acceptable. But, risk is a potential that something unwanted and harmful may occur. It is the result of an unsafe situation, sometimes unanticipated, during its use.

Probability of safety = $1 - \text{probability of risk}$

Risk = probability of occurrence $\times$ consequence in magnitude

Different methods are available to determine the risk (testing for safety)

1. Testing on the functions of the safety-system components.
2. Destructive testing: In this approach, testing is done till the component fails. It is too expensive, but very realistic and useful.
3. prototype testing: In this approach, the testing is done till the component fails (It is too expensive, bc) on a prototype

tional scale model with the help of computer components from the system. Dimensional analysis could be used to project the results at the actual conditions.

4. Simulation testing: with the help of computer, the simulations are done. The safe boundary may be obtained. The effects of some controlled input variables on the outcomes can be predicted in a better way.

Concept of Safety:

Safety has different connotations. A product, a project is safe, with(out) respect to a person or a group, at a given time, if its risks were fully known, and if the risks are judged to be acceptable, in the light of settled perspectives. When based on judgement safety, can be taken as objective. If the perspectives on values are taken then safety can be subjective as well.

Awareness and maintenance of this situation is called "Safety". The safety can be incorporated during design, pre-testing, operation, field applications, analog tests, and learning from the past or others.

The perception varies from person to person, based on one's physical condition, age, experience, expertise, and wisdom.

A second-hand electric heater when purchased was alright. But when used it might give electric shock and damage the human. Chlorinated municipal water supplied maybe considered as unsafe we may judge that the harm to the stomach is unacceptable. But it may really safeguard against gastroenteritis. Sometime, the individual or groups think motorbikes are unsafe and scooters are safe. Some may never think about safety at all. An aged person is likely to suffer from dust. A scissor with the child may be unsafe, but with an adult it can be safe.

Various factors that influence the perception of risk are,

1. probability of risk (the statistical nature of occurrence of risk).
2. Consequence of the risk. This is a quantitative measure. It can be physical damage or death of people, economic loss or damage of property, loss of money or reputation, degradation of the environment and sometimes mental agony.
3. Voluntaryness (i.e., for thrill and amusement or under compulsion (i.e. for thrill and amusement or under compulsion (involuntaryness).
4. magnitude i.e., number of people or extent of area involved.
5. proximity, the closeness of relationship with those affected or the gap in time scale.

7. Job-related, i.e., whether it is under compulsion or volition.

The knowledge of risk acceptance is useful to the engineers. The designer can redesign the product/project to include safety measures, so as to (a) allow the product fail safely, (b) abandon it safely, and (c) provide for safe escape/evacuation from the product site, and thus eliminate or minimize the human loss.

Types of Risks

- 1) Personal Risk
- 2) Public Risk
- 3) Reducing Risk (Improving Safety)
- 4) Voluntary Risk

1) Personal Risk: Assessing the involuntary personal risk is not an easy task. For example, a group residing near the Cement plant is exposed to a lot of risk. If suppose a Cement plant or refinery was to come up in the area where this group already reside, they will object the proposal. The adequacy of compensation amount payable can not be fixed reasonably. How to estimate the super value of an

Individual human being? For example, a person may be a father to his young ones, husband to his beloved wife, son to his aged parents, friend to the needy, and as well a guardian for his pet dogs.

There are persons who dared to serve people in dire straits, in spite of the risky situations where their lives were in stakes. For example, Mahatma Gandhi served people during Narakale Yatra, when dangers were present all over. For such saviors, there was no personal risk.

However, any of the following methodologies may be adopted to assess quantitatively, the personal risk:

1. Assess the voluntary activities (e.g., life insurance policy taken)
2. Assess the degree of occupational hazard (e.g., dust, radiation, and asbestos) and its effect on health.
3. Loss of senses such as sight (eyes), hearing (ears) and loss of limbs (immobility by the loss/damage to organs or disfigurement of the limbs or body).
4. Loss of earning capability, especially due to physical disability, and
5. Get assistance by trained arbiters.

2) Public Risk: Assessing the Public Risk is relatively easy, as in the societal value system the cost of disability can be averaged out. For example, the U.S. National Safety Council I adopts an equivalent of 6000 days (16.42 years), for death, as per the personal value system for social costs of disability.

- To assess the public risk, the loss on the assets and the correction costs are estimated. For example,
1. Loss of or reduction in future income or earning capacity due to loss of limbs or their capability.
 2. Costs associated with accident, which includes the transplantation or reinforcement of body parts / limbs, and medical treatment and
 3. Cost of welfare, which includes rehabilitation, provision of less-demanding alternate jobs, and other disability benefits.

3) Reducing Risk (Improving Safety)

Several techniques adopted to reduce the risks (or improve safety) in a product or process are listed as follows:

1. Application of inherent safety concepts in design, e.g.,

LPB Cylinder is provided with frame to protect the valve while handling and facilitate Cryogenic storage. A magnetic door catch provides an easy escape for children caught inside the 'fridge' accidentally.

2. Use of redundancy principle in the instrument protection / design. For example, use of stand by device, and back-up for computer storage.

3. Periodical monitoring (inspection) and testing of safety system to ensure reliability, e.g., fire extinguishers, earth system in electric circuits are checked periodically.

4. Issue of Operation manuals, training of the operating personnel and regular audits are adopted to ensure that the procedures are understood, followed and the systems are kept in working condition.

5. Development of well-designed emergency evacuation plan and regular rehearsal / drills to ensure preparedness, in case of emergency.

4) Voluntary Risk: Voluntary risk is the involvement of people in risky actions, although they know that these actions are unsafe. The people take these actions for thrill, amusement or fun. They also believe that they have full control over their actions (including the outcomes!) and equipments or animals handled, e.g., people participate in car

Racing and risky stunts.

X Testing becomes inappropriate when the products are

1. Tested destructively
2. when the test duration is long, and
3. when the components failing by tests are very costly. Alternate methods such as design of experiments, accelerated testing and computer-simulated tests are adopted in these circumstances.) X

Voluntary V/s Involuntary Risks

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Short term v/s Long term Consequences:

The consequences of a risk can be short term or long term. There are cases where violation of engineering codes, for instance may result in unfavourable impact, either for a short term or long term one should take enough care through physical exercise to prevent attack of sugar. If there is a sugar complaint, to contain it one has to continue to use medicine through out the life.

Long term Consequences:

Major floods may destroy the fertility of the fertile lands. for long time these long term consequences can be handled professionally to minimize the resultant damage

eg: fire started buildings, flats

Short term Consequences:

It is relatively comfortable to be managed If a Jewel is stolen, police complaint is lodged and

there will be a hunt for the criminal and it is quite likely that the police gets the clue for the theft. when a company goes for merger with another company it is liked that there could be positive and negatives.

consequences both in short and long term

ever happening it is statically non-verifiable.

Reversible effects :-

Reversability is the ability to map the source code structure back into the high level models during the implementation level

-How professional deals with the risks?

There are some risks which are unavoidable as technology advances, the issues of risk and decision making pervade everywhere and the constitute the major challenge of professionals including engineers

eg:- Imagine a building collapses after 3 years of its completion. Lord Buddha. Hussien Sagar, Engineers involves high degree of social experimentation. If a bridge not well design (or) constructed properly with all the care, it may effect the human lives.

Public Safety is the 1st priority for every engineer.

Engineers have multiple roles to play, they

Expected Probability:-

Probability explains the chances of happening (or) non-happening of an event. Risk is characterised by probability of an event, it is not a risk, it is uncertainty. In all situations involving risk. Probability can be expected from probability point of view, risk can be two types

- ① Stastical Verified risk
- ② Non-Verifiable risk

Stastical Verifiable risk:-

Such risk that can be determined based on directed observation is called Stastically Verifiable risk

Non-Verifiable risk:-

This risk arise from involuntary activities that are based on limited data sets and mathematical equations

eg: Risk of a earth quake, hitting a region is low, but because there is no record of such an event

are responsible for what they do. It may engineering design, development, research for making new proposal, writing reports, managing reports and personal and often for sales.

There are no. of risks where the risk can be reversed through appropriate remedial measures. Also they are cases where risks are reversible.

Threshold efforts of risk:-

Risk threshold is a tolerance (or) a bench mark said in terms of taking risk, beyond this level, it is not advisable to take risk for an expected rate of return (or) written on investment. Risk threshold vary from department to department, division to division, business unit to business unit within an organisation.

Some pre-requisites:-

- ① Determine the total exposure for your organisation.
- ② Determine Value at risk
- ③ Consider risk exposures in terms of potential and financial loss.

- ④ Comparable risk exposure and risk capacity for the Organisation
- ⑤ Keep always some funds to ready to meet the un-predicted risks
- ⑥ Assess your risk taking capacity considering
- ① risk data of quality
 - ② positive risk culture in terms of attitude.
 - ③ Industry Standards.

Delay risk Vs Immediate risk

Delayed risk :-

* There are certain risks where the impact is not felt immediately. Over a period of time their appears symptoms of deterioration in general health.

eg:- Sugar levels, -Cancer, Skin diseases.

* A wrong computation of cement, sand, combination for a construction also may not immediately show cracks in the building constructed.

eg:- Mild earth quake

* Professionals interventions of periodical well, monitor the progress either in terms of Construction (or) human wealth.

Where there are cases of delayed risk where things deteriorated from bad to worse and there could be loss of human health.

(a) where cancer could not be detected and treated at early stages, there is no remedy.

(b) Corruptions in organisations may lead to worsening of organisation culture and loss of public image.

(c) The responsibility of identifying the risks at the early levels on the top management.

Immediate Risk:-

Risks can be immediate. Immediate risk is also called an emergency. When there is an immediate to health, human life, property or environment it

It is called an emergency. Where it is emergency, there is high probability of escalating to cause immediate danger. This calls for urgent interventions is required to prevent a worsening of the situation.

eg: BP, release of poisonous gases, loss of sight or even blindness, there could be natural disasters such as floods, spillage in marine (or) tsunami for human life and animal life, (or) accidents

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4. Magnitude i.e., number of people or extent of area involved.
5. Proximity, the closeness of relationship with those affected or the gap in time scale.
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2. Destructive testing: In this approach, testing is done till the components fails. it is too expensive, but very realistic and useful.
3. Prototype testing: In this approach, the testing is done on a Proportional Scale model with all vital components fixed in System.

4. Simulation testing: With the help of computer, the simulations are done. The safe boundary may be obtained. The effects of some controlled input variable on outcomes can be predicted in a better way.

Safety lessons from the challenger

The safety lesson: Absolute safety is not possible. Any improvement in making a product safe involves an increase in the cost of production. A product involves primary cost and secondary cost; both are taken into consideration in calculating the total cost. The secondary costs are warranty expenses, loss of customer goodwill and loss of even customers and so on. Therefore it is very important for manufacturer and users to have some understanding to know about risks connected with any product and know how much it will cost to reduce those risks.

P- Primary cost of products, including cost of safety measures involved.

S- Secondary costs including warranty, loss of customer goodwill.

7. Total cost = $P + S$.