UNIT - 1

HUMAN VALUES

PART A

1. **Define spirituality? (NOV/DEC 2015)** (April/May 2019)
Spirituality is a way of living that emphasizes the constant awareness and recognition of the spiritual dimension (mind and its development) of nature and people, with a dynamic balance between the material development and the spiritual development. Spirituality includes creativity, communication, recognition of the individual as human being. Spirituality is motivation as it encourages the colleagues to perform better. Remember, lack of motivation leads to isolation. Spirituality is also energy: Be energetic and flexible to adapt to challenging and changing situations.

2. **What are the qualities of self confident people? (NOV/DEC 2015)**
1. A self-assured standing, positive thinking
2. Willing to listen to learn from others and adopt (flexibility),
3. Frank to speak the truth, and
4. Respect others' efforts and give due credit.

3. **Define moral values with suitable example. (APRIL/MAY 2015) (APRIL/MAY 2017)**
Morals are the welfare principles enunciated by the wise people, based on their experience and wisdom.

They were edited, changed or modified or evolved to suit the geography of the region, rulers (dynasty), and in accordance with development of knowledge in science and technology and with time.

A value is defined as a principle that promotes well-being or prevents harm."

Values are our guidelines for our success our paradigm about what is acceptable."

4. Define professionalism. (APRIL/MAY 2015)

It is the status of the professional which implies certain attitudes or typical qualities that are expected of a professional It is also defined as the services related to achieving a public good in addition to the practices of the knowledge of moral ideas.

5. Define work ethic. (APRIL 2014)(April/May 2019)

Work ethics is defined as a set of attitudes concerned with the value of work, which forms the motivational orientation. The 'work ethics' is aimed at ensuring the economy (get job, create wealth, earn salary), productivity (wealth, profit), safety (in workplace), health and hygiene (working conditions), privacy (raise family), security (permanence against contractual, pension, and retirement benefits), cultural and social development (leisure, hobby, and happiness), welfare (social work), environment (anti-pollution activities), and offer opportunities for all, according to their abilities, but without discrimination.

6. How character and values are related. (APRIL 2014)

Humans have the unique ability to define their identity, choose their values and establish their beliefs.

All three of these directly influence a person's behavior. People have gone to great lengths to demonstrate the validity of their beliefs, including war and sacrificing their own life! Conversely, people are not motivated to support or validate the beliefs of another, when those beliefs are contrary to their own.

7. Define integrity.

Integrity is defined as the unity of thought, word and deed (honesty) and open mindedness. It includes the capacity to communicate the factual information so that others can make well-informed decisions. It yields the person's 'peace of mind', and hence adds strength and consistency in character, decisions, and actions.

8. Define civic virtue.(April /May 2017)

Civic virtues are the moral duties and rights, as a citizen of the village or the country or an integral part of the society and environment. An individual may exhibit civic virtues by voting, volunteering, and organizing welfare groups and meetings.

9. Define caring.

Caring is feeling for others. It is a process which exhibits the interest in, and support for, the welfare of others with fairness, impartiality and justice in all activities, among the employees, in the context of professional ethics.

It includes showing respect to the feelings of others, and also respecting and preserving the interests of all others concerned. Caring is reflected in activities such as friendship, membership in social clubs and professional societies, and through various transactions in the family, fraternity, community, country and in international councils.

10. Define sharing

Sharing is a process that describes the transfer of knowledge (teaching, learning, and information), experience (training), commodities (material possession) and facilities with others. The transfer should be genuine, legal, positive, voluntary, and without any expectation in return.

However, the proprietary information it should not be shared with outsiders.

Through this process of sharing, experience, expertise, wisdom and other benefits reach more people faster.

11. Define honesty.

Honesty is a virtue, and it is exhibited in two aspects namely,

(a) Truthfulness and

(b) Trustworthiness.

Truthfulness is to face the responsibilities upon telling truth. One should keep one's word or promise. By admitting one's mistake committed (one needs courage to do that!), it is easy to fix them.

Reliable engineering judgment, maintenance of truth, defending the truth, and communicating the truth, only when it does 'good' to others, are some of the reflections of truthfulness. But trustworthiness is maintaining integrity and taking responsibility for personal performance.

12. Define courage

Courage is the tendency to accept and face risks and difficult tasks in rational ways. Self-confidence is the basic requirement to nurture

courage. Courage is classified into three types, based on the types of risks, namely

(a) Physical courage,

(b) Social courage, and

(c) Intellectual courage.

13. Define cooperation.

It is a team-spirit present with every individual engaged in engineering. Co-operation is activity between two persons or sectors that aims at integration of operations (synergy), while not sacrificing the autonomy of either party. Further, working together ensures, coherence, i.e., blending of different skills required, towards common goals.

14. Define Empathy..(April /May 2017)

Empathy is social radar. Sensing what others feel about, without their open talk, is the essence of empathy. Empathy begins with showing concern, and then obtaining and understanding the feelings of others, from others' point of view. It is also defined as the ability to put one's self into the psychological frame or reference or point of view of another, to know what the other person feels.

15. Define character.

It is a characteristic property that defines the behavior of an individual. It is the pattern of virtues (morally-desirable features). Character includes attributes that determine a person's moral and ethical actions and responses. It is also the ground on which morals and values blossom.

16. Define value time.

Time is rare resource. Once it is spent, it is lost for ever. It can not be either stored or recovered. Hence, time is the most perishable and most valuable resource too. This resource is continuously spent, whether any decision or action is taken or not.

17. What are the types of character.

(a) The sensitive (humble, contemplative and emotional,

(b) The active (great and the mediocre), and

(c) The apathetic (purely apathetic or dull), and

(d) The intelligent.

18. Define service learning. (APRIL/MAY 2017)

Service learning refers to learning the service policies, procedures, norms, and conditions, other than 'the technical trade practices'. The service learning includes the characteristics of the work, basic requirements, security of the job, and awareness of the procedures, while taking decisions and actions.

It helps the individuals to interact ethically with colleagues, to effectively coordinate with other departments, to interact cordially with suppliers as well as the customers, and to maintain all these friendly interactions.

19. What are all the objectives of professional ethics.

The objectives of the study on Professional Ethics may be listed as:

(a) Improvement of the cognitive skills (skills of the intellect in thinking clearly)

1. Moral awareness (proficiency in recognizing moral problems in engineering)
2. Cogent moral reasoning (comprehending, assessing different views)
3. Moral coherence (forming consistent viewpoints based on facts)
4. Moral imagination (searching beyond obvious the alternative responses to issues and being receptive to creative solutions)
5. Moral communication, to express and support one's views to others.

(b) To act in morally desirable ways, towards moral commitment and responsible conduct

6. Moral reasonableness i.e., willing and able to be morally responsible.
7. Respect for persons, which means showing concern for the well-being of others, besides oneself.
8. Tolerance of diversity i.e., respect for ethnic and religious differences, and acceptance of reasonable differences in moral perspectives.

9. Moral hope i.e., believe in using rational dialogue for resolving moral conflicts.

10. Integrity, which means moral integrity, and integrating one's professional life and personal convictions.

20. Differentiate Morality and Ethics

Morality

1. More general and prescriptive based on customs and traditions.
2. More concerned with the results of wrong action, when done.
3. Thrust is on judgment and punishment, in the name of God or by laws.
4. In case of conflict between the two morality is given top priority, because the damage is more. It is more common and basic.
5. Example: Character flaw, corruption, extortion, and crime.

Ethics

1. Specific and descriptive. It is a critical reflection on morals.
2. More concerned with the results of a right action, when not done.
3. Thrust is on influence, education, training through codes, guidelines, and correction.
4. Less serious, hence second priority only. Less common. But relevant today, because of complex interactions in the modern society.
5. Example: Notions or beliefs about manners, tastes, customs, and towards laws.

21. Define ethics

Ethics is the word that refers to morals, values, and beliefs of the individuals, family or the society. The word has several meanings. Basically it is an activity and process of inquiry. Secondly, it is different from non-moral problems, when dealing with issues and controversies. Thirdly, ethics refers to a particular set of beliefs, attitudes, and habits of individuals or family or groups concerned with morals.

PART B

1. What is courage? What are salient features of courage? (NOV/DEC 2015)

Courage is the tendency to accept and face risks and difficult tasks in rational ways. Self-confidence is the basic requirement to nurture courage.

Courage is classified into three types, based on the types of risks, namely

(a) Physical courage,

(b) Social courage, and

(c) Intellectual courage.

In physical courage, the thrust is on the adequacy of the physical strength, including the muscle power and armaments. People with high adrenalin, may be prepared to face challenges for the mere 'thrill' or driven by a decision to 'excel'. The social courage involves the decisions and actions to change the order, based on the conviction for or against certain social behaviors. This requires leadership abilities, including empathy and sacrifice, to mobilize and motivate the followers, for the social cause. The intellectual courage is inculcated in people through acquired knowledge, experience, games, tactics, education, and training. In professional ethics, courage is applicable to the employers, employees, public, and the press.

Look before you leap. One should perform Strengths, Weakness, Opportunities, and Threat (SWOT) analysis. Calculate (estimate) the risks, compare with one's strengths, and anticipate the end results, while taking decisions and before getting into action. Learning from the past helps. Past experience (one's own or borrowed!) and wisdom gained from self-study or others will prepare one to plan and act with self-confidence, succeed in achieving the desired ethical goals through ethical means. Opportunities and threat existing and likely to exist in future are also to be studied and measures to be planned. This anticipatory management will help any one to face the future with courage.

Facing the criticism, owning responsibility, and accepting the mistakes or errors when committed and exposed are the expressions of courage. In fact, this sets their mind to be vigilant against the past mistakes, and creative in finding the alternate means to achieve the desired objectives. Prof. Sathish Dhawan, Chief of ISRO, was reported to have exhibited his courage and owned responsibility, when the previous space mission failed,

but credited Prof. A.P.J. Abdul Kalam (now our revered President), when the subsequent mission succeeded.

The courageous people own and have shown the following characteristics, in their professions:

(a) Perseverance (sustained hard work),

(b) Experimentation (preparedness to face the challenges, that is, unexpected or unintended results),

(c) Involvement (attitude, clear and firm resolve to act), and

(d) Commitment (willing to get into action and to reach the desired goals by any alternative but ethical means).

2. Write short notes on honesty. (NOV/DEC 2015) (April/May 2019)

Honesty is a virtue, and it is exhibited in two aspects namely,

(a) Truthfulness and

(b) Trustworthiness.

Truthfulness is to face the responsibilities upon telling truth. One should keep one's word or promise. By admitting one's mistake committed (one needs courage to do that!), it is easy to fix them. Reliable engineering judgment, maintenance of truth, defending the truth, and communicating the truth, only when it does 'good' to others, are some of the reflections of truthfulness. But trustworthiness is maintaining integrity and taking responsibility for personal performance. People abide by law and live by mutual trust. They play the right way to win, according to the laws or rules (legally and morally). They build trust through reliability and authenticity. They admit their own mistakes and confront unethical actions in others and take tough and principled stand, even if unpopular.

Honesty is mirrored in many ways. The common reflections are:

(a) Beliefs (intellectual honesty).

(b) Communication (writing and speech).

(c) Decisions (ideas, discretion).

(d) Actions (means, timing, place, and the goals).

(e) Intended and unintended results achieved.

As against this, some of the actions of an engineer that leads to dishonesty are:

1. Lying:

Honesty implies avoidance of lying. An engineer may communicate wrong or distorted test results intentionally or otherwise. It is giving wrong information to the right people.

2. Deliberate deception:

An engineer may judge or decide on matters one is not familiar or with insufficient data or proof, to impress upon the customers or employers. This is a self deceit.

3. Withholding the information:

It means hiding the facts during communication to one's superior or subordinate, intentionally or otherwise.

4. Not seeking the truth:

Some engineers accept the information or data, without applying their mind and seeking the truth.

5. Not maintaining confidentiality:

It is giving right information to wrong people. The engineers should keep information of their customers/clients or of their employers confidential and should not discuss them with others.

6. Giving professional judgment under the influence of extraneous factors such as personal benefits and prejudice. The laws, experience, social welfare, and even conscience are given

a go-bye by such actions. Certainly this is a higher-order crime.

3. Explain with suitable example how the respect for others religious beliefs enhances the peaceful living. (APRIL 2014)

Respect for others

This is a basic requirement for nurturing friendship, team work, and for the synergy it promotes and sustains. The principles enunciated in this regard are:

1. Recognize and accept the existence of other persons as human beings, because they have a right to live, just as you have.
2. Respect others' ideas (decisions), words, and labor (actions). One need not accept or approve or award them, but shall listen to them first. One can correct or warn, if they commit mistakes. Some people

may wait and watch as fun, if one falls, claiming that they know others' mistakes before and know that they will fall! Appreciate colleagues and subordinates on their positive actions. Criticize constructively and encourage them. They are bound to improve their performance, by learning properly and by putting more efforts.

3. Show 'goodwill' on others. Love others. Allow others to grow. Basically, the goodwill reflects on the originator and multiplies itself on everybody. This will facilitate collinearity, focus, coherence, and strength to achieve the goals.

LIVING PEACEFULLY

To live peacefully, one should start install peace within (self). Charity begins at home. Then one can spread peace to family, organisation where one works, and then to the world, including the environment. Only who are at peace can spread peace.

You can not gift an article which you do not possess. The essence of oriental philosophy is that one should not *fight* for peace. It is oxymoron. War or peace can be won only by peace, and *not by wars !*

One should adopt the following means to live peacefully, in the world:

Nurture

1. Order in one's life (self-regulation, discipline, and duty).
2. Pure thoughts in one's soul (loving others, blessing others, friendly, and not criticizing or hurting others by thought, word or deed).
3. Creativity in one's head (useful and constructive).
4. Beauty in one's heart (love, service, happiness, and peace).

Get

5. Good health/body (physical strength for service).

Act

6. Help the needy with head, heart, and hands (charity). Service to the poor is considered

holier than the service to God.

7. Not hurting and torturing others either physically, verbally, or mentally.

The following are the factors that promote living, with internal and external peace:

1. Conducive environment (safe, ventilated, illuminated and comfortable).
2. Secured job and motivated with 'recognition and reward'.
3. Absence of threat or tension by pressure due to limitations of money or time.
4. Absence of unnecessary interference or disturbance, except as guidelines.
5. Healthy labor relations and family situations.
6. Service to the needy (physically and mentally-challenged) with love and sympathy.

4. Explain in detail about virtue.

Virtues are positive and preferred values. Virtues are desirable attitudes or character traits, motives and emotions that enable us to be successful and to act in ways that develop our highest potential. They energize and enable us to pursue the ideals that we have adopted. Honesty, courage, compassion, generosity, fidelity, integrity, fairness, transparency, self-control, and prudence are all examples of virtues.

Civic Virtues

Civic virtues are the moral duties and rights, as a citizen of the village or the country or an integral part of the society and environment. An individual may exhibit civic virtues by voting, volunteering, and organizing welfare groups and meetings.

The duties are:

1. To pay taxes to the local government and state, in time.
2. To keep the surroundings clean and green.
3. Not to pollute the water, land, and air by following hygiene and proper garbage disposal.

For example, not to burn wood, tyres, plastic materials, spit in the open, even not to smoke in the open, and not to cause nuisance to the public, are some of the civic (duties) virtues.

4. To follow the road safety rules.

On the other hand, the rights are:

1. To vote the local or state government.
2. To contest in the elections to the local or state government.
3. To seek a public welfare facility such as a school, hospital or a community hall or transport or communication facility, for the residents.
4. To establish a green and safe environment, pollution free, corruption free, and to follow ethical principles. People are said to have the right to breathe in fresh air, by not allowing smoking in public.
5. People have inalienable right to accept or reject a project in their area. One has the right to seek legal remedy, in this respect, through public interest petition.

George Washington4 embodied the civic virtues as indispensable for a self-governing administration.

These virtues are divided into four categories:

1. Civic Knowledge

Citizens must understand what the Constitution says about how the government is working, and what the government is supposed to do and what not to do. We must understand the basis of our responsibilities as citizens, besides duties and rights. We must be able to recognize when the government or another citizen infringes upon our rights. It implies that the government requires the participation of the enlightened citizens, to serve and survive.

2. Self-Restraint

For citizens to live in a free society with limited government each citizen must be able to control or restrain himself; otherwise, we would need a police state—that is, a dictatorial government to maintain safety and order. He advocated for morality and declared that happiness is achieved and sustained through virtues and morals. He advocated and demonstrated self-restraint several times in his private and public life, and naturally he was a great leader.

3. Self-Assertion

Self-assertion means that citizens must be proud of their rights, and have the courage to stand up in public and defend their rights. Sometimes, a government may usurp the very rights that it was created to protect. In such

cases, it is the right of the people to alter or abolish that government (e.g., voting rights, rights call back).

4. Self-Reliance

Citizens who cannot provide for themselves will need a large government to take care of them. Once citizens become dependent on government for their basic needs, the people are no longer in a position to demand that government act within the confines of the Constitution. Self-reliant citizens are free citizens in the sense that they are not dependent on others for their basic needs. They do not need a large provider-government, which has the potential to become an oppressive government, to meet those needs. Only a strong self-reliant citizenry will be able to enjoy fully the blessings of liberty. These civic virtues, applicable to local, state, and central governments, nourish freedom and civil liberty at the root of democracy.

5. Define value .What are the types of values?

Humans have the unique ability to define their identity, choose their values and establish their beliefs.

All three of these directly influence a person's behavior. People have gone to great lengths to demonstrate the validity of their beliefs, including war and sacrificing their own life! Conversely, people are not motivated to support or validate the beliefs of another, when those beliefs are contrary to their own. People will act congruent with their personal values or what they deem to be important.

A value is defined as a principle that promotes well-being or prevents harm." Another definition is: Values are our guidelines for our success—our paradigm about what is acceptable." Personal values

are defined as: "Emotional beliefs in principles regarded as particularly favorable or important for the individual." Our values associate emotions to our experiences and guide our choices, decisions andactions.

A person's observations on its environment are filtered through his values to determine whether or not he should expend energy to do something about his experiences. A person who values gold and sees a large bag of gold (a positive value) in his path as he walks, will be motivated to reach down and pick it up. A person who values his life and knows about venomous snakes will retreat from the sound of a rattlesnake (a negative value) from nearby, when he is walking in the desert. Said in another way,

"Values are the scales we use to weigh our choices for our actions, whether to move towards or away from something."

A person's beliefs, values and identity are usually acquired unconsciously based on his personal experience or observations of others' experiences as to what produces desirable or undesirable results in the environment. A baby's learning *to walk and talk* is a clear example of identifying with human adults, valuing the act of being able to have the mobility and communication ability of an adult and the belief, based on unconscious observation, that humans can do walk and do talk with each other.

Types of values

The five core human values are: (1) Right conduct, (2) Peace, (3) Truth, (4) Love, and (5) Nonviolence.

1. Values related to RIGHT CONDUCT are:
   (a) SELF-HELP SKILLS: Care of possessions, diet, hygiene, modesty, posture, self reliance, and tidy appearance
   (b) SOCIAL SKILLS: Good behavior, good manners, good relationships, helpfulness, No wastage, and good environment, and
   (c) ETHICAL SKILLS: Code of conduct, courage, dependability, duty, efficiency, ingenuity, initiative, perseverance, punctuality, resourcefulness, respect for all, and responsibility
2. Values related to PEACE are: Attention, calmness, concentration, contentment, dignity, discipline, equality, equanimity, faithfulness, focus, gratitude, happiness, harmony, humility, inner silence, optimism, patience, reflection, satisfaction, self-acceptance, self-confidence, self-control, self-discipline, self-esteem, self-respect, sense control, tolerance, and understanding
3. Values related to TRUTH are: Accuracy, curiosity, discernment, fairness, fearlessness, honesty, integrity (unity of thought, word, and deed), intuition, justice, optimism, purity, quest for knowledge, reason, self-analysis, sincerity, sprit of enquiry, synthesis, trust, truthfulness, and determination.
4. Values related to LOVE are: Acceptance, affection, care, compassion, consideration, dedication, devotion, empathy, forbearance, forgiveness, friendship, generosity, gentleness, humanness, interdependence,

kindness, patience, patriotism, reverence, sacrifice, selflessness, service, sharing, sympathy, thoughtfulness, tolerance and trust

5. Values related to NON-VIOLENCE are:

(a) PSYCHOLOGICAL: Benevolence, compassion, concern for others, consideration, forbearance, forgiveness, manners, happiness, loyalty, morality, and universal love

(b) SOCIAL: Appreciation of other cultures and religions, brotherhood, care of environment, citizenship, equality, harmlessness, national awareness, perseverance, respect for property, and social justice.

PERSEVERANCE is defined as persistence, determination, resolution, tenacity, dedication, commitment, constancy, steadfastness, stamina, endurance and indefatigability. To persevere is described as to continue, carry on, stick at it (in formal), keep going, persist, plug away, (informal), remain, stand firm, stand fast, hold on and hang on. Perseverance builds character.

ACCURACY means freedom from mistake or error; conformity to truth or to a standard or model and exactness. Accuracy is defined as correctness, exactness, authenticity, truth, veracity, closeness to truth (true value) and carefulness. The value of accuracy embraces a large area and has many implications. Engineers are encouraged to demonstrate accuracy in their behavior through the medium of praise and other incentives. Accuracy includes telling the truth, not exaggerating, and taking care over one's work.

DISCERNMENT means discrimination, perception, penetration, and insight. Discernment means the power to see what is not obvious to the average mind. It stresses accuracy, especially in reading character or motives. Discrimination stresses the power to distinguish or select what is true or genuinely excellent. Perception implies quick and often sympathetic discernment, as of shades of feelings.

Penetration implies a searching mind that goes beyond what is obvious or superficial. Insight suggests depth of discernment.

Evolution of Human Values

The human values evolve because of the following factors:

1. The impact of norms of the society on the fulfillment of the individual's needs or desires

2. Developed or modified by one's own awareness, choice, and judgment in fulfilling the needs.

3. By the teachings and practice of Preceptors (Gurus) or Saviors or religious leaders.

4. Fostered or modified by social leaders, rulers of kingdom, and by law (government).

6. Explain in detail about work ethics.

Industry and Society are the two systems which interact with each other and are interdependent. Society requires industry/business system which provides manufacturing, distribution and consumption activities.

It needs investment (capital input), labor (input), supply (raw materials), production (industries, business organizations), marketing and distribution (transport), and consumption (public, customer). A lot of transactions (and interactions) between these sub-systems involving people are needed for the welfare of the society. It is here, the work ethics plays an essential role.

Work ethics is defined as *a set of attitudes concerned with the value of work, which forms the motivational orientation*. The 'work ethics' is aimed at ensuring the economy (get job, create wealth, earn salary), productivity (wealth, profit), safety (in workplace), health and hygiene (working conditions), privacy (raise family), security (permanence against contractual, pension, and retirement benefits), cultural and social development (leisure, hobby, and happiness), welfare (social work), environment (anti-pollution activities), and offer opportunities for all, according to their abilities, but without discrimination.

Many complex social problems exist in the industrial/business scenario, because:

1. The people desire to be recognized as individuals and treated with dignity, as living human beings. Work is intrinsically valuable so far as it is enjoyable or meaningful in allowing personal expression and self-fulfillment. Meaningful work is worth doing for the sense of personal identity and the self-esteem it holds.

2. Economic independence: Work is the major instrumental good in life. It is the main source of providing the income needed to avoid economic dependence on others, for obtaining desired materials and services, and for achieving status and recognition from others.

3. Pay as well as the pace of work should be in commensurate with the expertise required, acquired, and utilized in the persons. Exploitation and bargained pay should be discouraged.

4. Privacy (personal freedom) of the employee, including women, is to be protected. At the same time, confidentiality of the employer is also to be protected. Mutual trust and loyalty both ways play major roles in this aspect.

5. Security during job and upon retirement: This concept is being accepted only in government jobs, public limited companies, and corporate organizations. The western thought has influenced the Indian private industries and multinationals in a paradigm shift from 'lifelong employment' to policies such as 'merit only', 'hire and fire', 'pay and use' etc. This situation has no doubt created tension in the Indian scene.

6. Recognition to non-work activities, such as leisure, paid holiday on the day of visit of a dignitary, social service, and other developmental activities. The workers in prosperous countries are less willing to consider 'work' as their prime interest in life. They claim that such service activities give them *peace of mind* and *happiness*. However, such a trend is likely to decline the work ethics.

7. Hard work and productivity are very essential for the success of an industry. The quality of work life deserves to be improved. Hard labor, undignified jobs (human-drawn *rikshaw*, people carrying night soil), and hazardous jobs are to be made less straining, dignified, and safer. Automation and CNC systems to a large extent have been successful in lessening the human burden. Still, many a hard work can not be replaced by 'virtual work', in the near future.

8. Employee alienation: Absence of or inadequate 'recognition and reward system' and 'grievance redressal system', lack of transparency in policy implementation, factions in trade unions etc. lead to ethical problems, affecting the work ethics. Participative management, quality circles, job rotation, and flexible working hours are some of the measures to counter this situation.

9. A different view of work ethics: Work is considered as a necessary evil. It is a thing one must do in order to avoid worse evils, such as dependency and poverty. That is a major source of anxiety and unhappiness.

10. As per the Protestant Work Ethics, the financial success is a sign that is favored by God. It means making maximal profit is a duty mandated by God. It is to be obtained rationally, diligently, and without compromising with other values such as spending time with one's family and not exploiting or harming others1 To work (job), is not for monetary considerations only. Human beings believe that it is good to work. Work is good for the body and mind. It promotes self-respect, self-esteem, good for the family, and obligation to the society and allow the world to prosper. Work lays a moral and meaningful foundation for life. That is why, work ethics affirm s that, the work *per se* is worthy, admirable and valuable at personal and social levels. It improves the quality of life and makes life purposeful, successful, and happy.

By work ethics, duties to the self, family, society, and nation are fulfilled. Rights of the individuals are respected and nourished. Values and virtues are cultivated and enjoyed by all human beings. Further, the quality of life is improved and the environment protected. On the other hand, unemployment and under-employment lead to frustration, social tensions, and occasional militancy. For a developing economy and society, like ours, we need to *promote work ethics*, at all levels, to flourish as developed nation.

7. Explain in detail about service learning.

Service learning refers to learning the service policies, procedures, norms, and conditions, other than 'the technical trade practices'. The service learning includes the characteristics of the work, basic requirements, security of the job, and awareness of the procedures, while taking decisions and actions. It helps the individuals to interact ethically with colleagues, to effectively coordinate with other departments, to interact cordially with suppliers as well as the customers, and to maintain all these friendly interactions.

Alternatively, the service learning may be defined as the *non-paid activity*, in which service is provided on voluntary basis to the public (have-nots in the community), non-profitable institutions, and charitable organizations. It is the service during learning. This includes training or study on real life problems and their possible solutions, during the formal learning, i.e., courses of study. In the industrial scenario, adoption, study, and development of public health or welfare or safety system of a village or school is an example of service learning by the employees. The engineering student

analyzing and executing a socially-relevant project is another example of service learning.

The service learning is a methodology falling under the category of experiential education3. It is one of the forms of experiential learning and community service opportunities. It is distinguished in the following ways:

1. *Connection to curriculum*: Integrating the learning into a service project is a key to successful service learning. Academic ties should be clear and built upon existing disciplinary skills.
2. *Learner's voice*: Beyond being actively engaged in the project, trainees have the opportunity to select, design, implement, and evaluate their service activity.
3. *Reflection*: Structured opportunities are created to think, talk, and write about the service experience. The balance of reflection and action allows the trainee to be constantly aware of the impact of their *work*.
4. *Partners in the community*: Partnership with community agencies are used to identify genuine needs, provide mentorship, and contribute input such as labor and expertise towards completing the project.

8. Explain in detail about caring and sharing.

Caring is feeling for others. It is a process which exhibits the interest in, and support for, the welfare of others with fairness, impartiality and justice in all activities, among the employees, in the context of professional ethics. It includes showing respect to the feelings of others, and also respecting and preserving the interests of all others concerned. Caring is reflected in activities such as friendship, membership in social clubs and professional societies, and through various transactions in the family, fraternity, community, country and in international councils.

SHARING

Primarily, caring influences 'sharing'. Sharing is a process that describes the transfer of knowledge (teaching, learning, and information), experience (training), commodities (material possession) and facilities with others. The transfer should be genuine, legal, positive, voluntary, and without any expectation in return. However, the proprietary information it should not be shared with outsiders. Through this process of sharing, experience, expertise, wisdom and other benefits reach more people faster. Sharing is

voluntary and it can not be driven by force, but motivated successfully through ethical principles. In short, sharing is 'charity'

For the humanity, 'sharing' is a *culture*. The 'happiness and wealth' are multiplied and the 'crimes and sufferings' are reduced, by sharing. It paves the way for peace and obviates militancy. Philosophically, the sharing maximizes the happiness for all the human beings. In terms of psychology, the fear, divide, and distrust between the 'haves' and 'have-nots' disappear. Sharing not only paves the way to prosperity, early and easily, and sustains it. Economically speaking, benefits are maximized as there is no wastage or loss, and everybody gets one's needs fulfilled and satisfied. Commercially speaking, the profit is maximized. Technologically, the productivity and utilization are maximized by sharing.

In the industrial arena, code-sharing in airlines for bookings on air travels and the common Effluent Treatment Plant constructed for small-scale industries in the industrial estates, are some of the examples of sharing. The co-operative societies for producers as well as consumers are typical examples of sharing of the goods, profit and other social benefits.

Here is an anecdote that illustrates the benefits of sharing, for the young minds!

The shouting...the screaming…the fighting. That was the breaking point for me as I poured out my woes to my mother. "How can I get them to *share* as well as we did as kids?", I pleaded. Laughter was her reply. "Well, thanks a lot, mom," I said. "I'm sorry," she chuckled, "but you didn't always share." She went on to explain about the "Box of Misbehaved Toys." Every time we fought over a toy, she would quietly take that and put it into the box.

Yes, I did remember that box. I also remember it wasn't always fair since one person may have caused all the commotion. But my mother was consistent. No matter what the reason for the struggle was, the toy disappeared into the box for one week. No questions asked, and no chance of parole. My siblings and I soon learned that sharing a toy was better than losing it. Often, one person would decide to just wait for a time when no one else was playing with the toy, rather than fight and lose it. It was not a perfect system, but I tried it anyway

That box was a shock to my kids and it was close to full, within a few days…..As the weeks progressed, I noticed the box was emptier and the

rguing was less. Today, I heard quiet music to my ears as my son said to his sister, "That's OK, you can play with it."

This story illustrates the worthy joy of sharing as compared to the pain of losing.

9. Explain in detail about value time and cooperation

Valuing Time

Time is rare resource. Once it is spent, it is lost for ever. It can not be either stored or recovered. Hence, time is the most perishable and most valuable resource too. This resource is continuously spent, whether any decision or action is taken or not.

The history of great reformers and innovators have stressed the importance of time and valuing time. The proverbs, 'Time and tide wait for nobody' and 'Procrastination is the thief of time' amply illustrate this point.

An anecdote to highlight the 'value of time' is as follows: To realize the value of one year, ask the student who has failed in the examinations;. To realize the value of one month, ask the mother who has delivered a premature baby; to realize the value of one week, ask the editor of weekly; to realize the value of one day, ask the daily-wage laborer; to realize now the value of one hour, ask the lovers longing to meet; to realize the value of one minute, ask a person who has missed the train; to realize the value of one second, ask the person who has survived an accident; to realize the value one milli second, ask the person who has won the bronze medal in Olympics; to realize the value of one micro second, ask the NASA team of scientists; to realize the value of one nano-second, ask a Hardware engineer!; If you have still not realized the value of time, wait; are you an Engineer?

Cooperation

It is a team-spirit present with every individual engaged in engineering. Co-operation is activity between two persons or sectors that aims at integration of operations (synergy), while not sacrificing the autonomy of either party. Further, working together ensures, coherence, i.e., blending of different skills required, towards common goals.

Willingness to understand others, think and act together and putting this into practice, is cooperation. Cooperation promotes collinearity, coherence (blend), co-ordination (activities linked in sequence or priority) and the

synergy (maximizing the output, by reinforcement). The whole is more than the sum of the individuals. It helps in minimizing the input resources (including time) and maximizes the outputs, which include quantity, quality, effectiveness, and efficiency.

According to professional ethics, cooperation should exist or be developed, and maintained, at several levels; between the employers and employees, between the superiors and subordinates, among the colleagues, between the producers and the suppliers (spare parts), and between the organisation and its customers.

The codes of ethics of various professional societies insist on appropriate cooperation to nourish the industry. The absence of cooperation 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.

The impediments to successful cooperation are:

1. Clash of ego of individuals.
2. Lack of leadership and motivation.
3. Conflicts of interests, based on region, religion, language, and caste.
4. Ignorance and lack of interest. By careful planning, motivation, leadership, fostering and rewarding team work, professionalism and humanism beyond the 'divides', training on appreciation to different cultures, mutual understanding 'cooperation' can be developed and also sustained.

10. Explain in detail about commitment and empathy.

Commitment

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 the expected end results (confidence). It means one should have the conviction without an iota of doubt that one will succeed. Holding sustained interest and firmness, in whatever ethical means one follows, with the fervent attitude and hope that one will achieve the goals, is commitment. It is the driving force to realize success.

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. Only when the teacher (Guru) is committed to his job, the students will succeed in life and contribute 'good' to the society. The commitment of top management will naturally lead to committed employees, whatever may be their position or emoluments. This is bound to add wealth to oneself, one's employer, society, and the nation at large.

EMPATHY

Empathy is social radar. Sensing what others feel about, without their open talk, is the essence of empathy. Empathy begins with showing concern, and then obtaining and understanding the feelings of others, from others' point of view. It is also defined as the ability to put one's self into the psychological frame or reference or point of view of another, to know what the other person feels. It includes the imaginative projection into other's feelings and understanding of other's background such as parentage, physical and mental state, economic situation, and association. This is an essential ingredient for good human relations and transactions.

To practice 'Empathy', a leader must have or develop in him, the following characteristics 5

1. *Understanding others*: It means sensing others feelings and perspectives, and taking active interest in their welfare.
2. *Service orientation*: It is anticipation, recognition and meeting the needs of the clients or customers.
3. *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 strength and accomplishments, and then coach the individual, by informing about what was wrong, and giving correct feedback and positive expectation of the subject's abilities and the resulting performance.
4. *Leveraging diversity* (opportunities through diverse people): This leads to enhanced organizational learning, flexibility, and profitability.
5. *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).
3. Good vendor-producer relationship (in partnering.) Through the above three, we can maximize the output and profit, as well as minimizing the loss. While dealing with customer complaints, empathy is very effective in realising the unbiased views of others and in admitting one's own limitations and failures. According to Peter Drucker, purpose of the business is not to *make a sale*, but to *make and keep a customer*. Empathy assists one in developing courage leading to success!

11. Explain in detail about self confidence.

SELF-CONFIDENCE

Certainty in one's own capabilities, values, and goals, is self-confidence. These people are usually positive thinking, flexible and willing to change. They respect others so much as they respect themselves.

Self-confidence is positive attitude, wherein the individual has some positive and realistic view of himself, with respect to the situations in which one gets involved. The people with self-confidence exhibit courage to get into action and unshakable faith in their abilities, whatever may be their positions.

They are not influenced by threats or challenges and are prepared to face them and the natural or unexpected consequences.

The self-confidence in a person develops a sense of partnership, respect, and accountability, and this helps the organization to obtain maximum ideas, efforts, and guidelines from its employees. The people with self-confidence have the following characteristics:

1. A self-assured standing,
2. Willing to listen to learn from others and adopt (flexibility),
3. Frank to speak the truth, and
4. Respect others' efforts and give due credit.

On the contrary, some leaders expose others when failure occurs, and own the credit when success comes.

The factors that shape self-confidence in a person are:

1. Heredity (attitudes of parents) and family environment (elders),
2. Friendship (influence of friends/colleagues),
3. Influence of superiors/role models, and
4. Training in the organization (e.g., training by Technical Evangelists at Infosys Technologies).

The following methodologies are effective in developing self-confidence in a person:

1. Encouraging SWOT analysis. By evaluating their strength and weakness, they can anticipate and be prepared to face the results.
2. Training to evaluate risks and face them (self-acceptance).
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 (e.g., Sam Walton of Wal-Mart, USA).

12. Explain in detail about Integrity?

(April/May 2019) (April/May2018)

13. Integrity:

Many people appear to use the word "integrity" in a vague manner as an alternative to the perceived potential in correctness of using blatantly moralistic terms such as "good" or ethical.

Integrity is holding true to ones values said another way: being ones word, doing what you said you would do (by when / how) you said you would do it.

Integrity is knowing what is important to you and living your actions accordingly. A more formal study of the term integrity and its meaning in modern ethics. It is often understood not only as a refusal to engage in behavior that evades responsibility.

People of integrity consistently act according to principles – not just what might work at the moment. Leaders of integrity make their principles known and act accordingly with them. An Army Leader says what they

mean and do what they say. If you can't accomplish a mission, inform your

chain of command. If you inadvertently pass on bad information, correct it as soon as you find out its wrong.

People of integrity do the right thing not because its convenient or because they have no choice.

14. Write Brief notes on Yoga and Meditation for Professional Excellence and Stress Management? (NOV 2015) (APRIL/MAY 2017) (April/May 2019)

Introduction to Yoga and Meditation:

Yoga:

The word "yoga" means "yoke" or "unity" translated from Sanskrit. It also meand "discipline" or "effort". Meditation is a part of yoga.

Types of yoga:

1. Ananda
2. Ashthange
3. Bikram
4. Iyengar
5. Kundalini
6. Sivananda
7. Viniyoga

Yoga and meditation decrease sympathetic tone and reduce feelings of stress and anxiety. Many modern health problems are worsened by stress and anxiety. Yoga works to decrease sympathetic one.

Doing yoga on a regular basis gives the body a chance to break the habit of being sluggish and stiff. Glands, nervous system, heart and intestines are touched and kept flexible or restored and activated.

Meditation:

Meditation is a technique in which the meditator seeks not only to reach a deep state of relaxation, but to quiet the mind.

The aim of mediation is to quiten the mind and punge it of its tendency, controlling the mind by preventing it to fall an easy victim to the onslaughts of lust, grief, blinding rage, undue haste, persistent strong desires for new acquisition etc.

Medication is a way of bring the bustling mind to stilless and tranguility elimination conscious thought and offering the meditator a unique concentration and "one-pointedness of ming". An internal balance, mental collectedness and acute awareness of the present moment are all said to be present during meditation

Meditation involves sitting in a relaxed position and clearing your mind. You may focus on a sound, like "ooommm" or on your own breathing or on nothing at all. Its necessary to have atleast is to do distraction, free minutes to spend.

Meditation Techniques:

Concentrative meditation focuses the attention on the breath, an image or a sound in order to still the mind and allow a greater awareness and clarity to emerge.

Mindfulness meditations purpose is to increase awareness of " sensations and feelings" around oneself, but at a distance.

Meditation for Professional Excellence:

Meditation for corporate professionals is an essential and effective tool for stress reduction and stress management in the work place. Many industry, leaders and corporate professionals successfully use the meditation for relaxation.

Meditation is based on the principle of collaborative problem – solving with a focus on the future and rebuilding relationships, rather than apportioning blame.

Meditation May not be Suitable for:

- Used as a first resort because people who should be encouraged to speak to each other and talk to their manager before they seek a solution via mediation.
- It is used by a manager to avoid their managerial responsibilities.
- The Parties do not have the power to settle the issue.
- One side is completely intransigent and using mediation will raise unrealistic expectation of a positive outcome.

Stress Management:

The point of stress reduction and stress management programs is not to eliminate stress from our lives entirely. Life is always going to be full of

challenges, and a life without some turmoil is not only impossible but is also undesirable.

Many stress therapists recognize that regular mediation and relaxation can be significant help in reducing stress to manageable and healthy levels and relaxation and meditation exercises are now widely taught.

Types of Stress:

1. Eustress – Positive Stress
2. Dustress – Negative Stress

Common Characteristics of EUSTRESS:

- Improve Performance
- Short term in nature
- Motivates and focuses energy
- Feels Energizing
- Believed to be within our capabilities

15. Explain in detail about:

a) Moral b) Ethics c) Values d)spirituality(April/May 2018)

Moral:

Morals are guiding principles that every citizen should hold.

- Morals are foundational concepts defined on both an individual and societal level.
- At the most basic level, morals are the knowledge of the difference between right and wrong Morals are values that we attribute to a system of beliefs that help the individual define rights versus wrong, good versus bad.

Ethics:

Ethics is the study of what we understand to be good and right behavior and how people make those judgement.

Personal Ethics:

Simply put, all individuals are morally autonomous beings with the power and right to choose their values, but it does not follow that all choices and all value systems have an equal claim to be called ethical.

- Actions and beliefs inconsistent with the Six Pillars of Character -trustworthiness, respect, simply not ethical. responsibility, fairness, caring and citizenship - are

PERSONAL ETHICS - everyday examples

- Software piracy
- Expense account padding
- Copying of homework or tests
- Income taxes
- "Borrowing" nuts and bolts, office supplies from employer
- Copying of Videos or CD"s
- Plagiarism
- Using the copy machine at work

RELIGION AND ETHICS

- The "Golden Rule" is a basic tenet in almost all religions: Christian,
  Hindu, Jewish, Confucian, Buddhist, Muslim.
- "Do unto others as you would have others do unto you."
- "Treat others as you would like them to treat you" (Christian).
- "Hurt not others with that which pains you" (Buddhist)
- "What is hateful to yourself do not do toyour fellow men" (Judaism)
- "No man is a true believer unless he desires for his brother that
  which he desires for himself" (Islam)

MORALITY AND ETHICS

- Concerns the goodness of voluntary human conduct that affects itself or other living things
- Morality (Latin *mores*) usually refers to any aspect of human action
- Ethics (Greek *ethos*) commonly refers only to professional behavior
- Ethics consist of the application of fundamental moral

principles and reflect our dedication to fair treatment of each other, and of society as a whole.

- An individual"s own values can result in acceptance or rejection of society"s ethical standards because even thoughtfully developed ethical rules can conflict with individual values.

ASPECTS OF ETHICS

There are two aspects to ethics:

- The first involves the ability to discern right from wrong, good from evil and propriety from impropriety.
- The second involves the commitment to do what is right, good and proper. Ethics entails action.

An ALGEBRA course will teach you ALGEBRA.

A HISTORY course will teach you HISTORY.

A MANAGEMENT course will teach you principles of MANAGEMENT.

But, W ill an *ETHICS* course teach you to be E*TH ICAL*? Think !

Values:

- Values are individual in nature.
- Values are comprised respect. of personal concepts of responsibility, entitlement and
- Values are shaped by personal experience, may change over the span of a lifetime and may be influenced by lessons learned.
- Values may vary according to an individual"s cultural, ethnic and/or faith- based background.

"Never change your core values." In spite of all the change around you, decide upon what you will never change: your core values. Take your time to decide what they are but once you do, do not compromise on them for any reason.

Integrity is one such value.

Values can be categorized in to three areas:

Moral: Fairness, Truth, Justice, Love, Happiness

Pragmatic: Efficiency, Thrift, Health, Variety, Patience

Aesthetic: Attractive, Soft, cold, Square.

These values typically get their authority from something outside the individual – a higher being or higher authority (eg. Government)

Moral Concepts, Judgement and practices may vary from one society to another. The moral concept of "justice" has one meaning in the united states that is grounded in the formation and application of civil law.

When one acts in ways that are consistent with our moral values we will characterize that as acting ethically. When one's actions are not congruent with our moral values – our sense of right, good and just we will view that as acting unethically.

If ethics and morality are important are group and organizations they should also be important for public officials are for very much the same reasons.

Six types of morality:

1. Basic honesty and conformity to law
2. Conflicts of interest
3. Service orientation and procedural fairness
4. The Ethics of democratic responsibility
5. The Ethics of public policy determination
6. The Ethics of compromise and social integration

Spirituality:

Spirituality is in a narrow sense, a concern with matters of the spirit. The spiritual, concerning as it does eternal verities regarding man's ultimate nature is often contrated with the or the wordly.

The central defining characteristic of spirituality is a sense of connection to a much greater whole which includes an emotional experience of religious awe and reverence.

As with some forms of religion the emphasis of spirituality is often on personel experience. It may be an expression for life perceived as higher, more complex or more integrated with ones word view as contrasted with the merely sensual.

UNIT - 2

ENGINEERING ETHICS

PART A

1. What is meant by moral autonomy? (NOV/DEC 2015)(April/May 2018)

Moral autonomy is defined as, decisions and actions exercised on the basis of moral concern for other people and recognition of good moral reasons. Alternatively, moral autonomy means 'self determinant or independent'. The autonomous people hold moral beliefs and attitudes based on their critical reflection rather than on passive adoption of the conventions of the society or profession. Moral autonomy may also be defined as a skill and habit of thinking rationally about the ethical issues, on the basis of moral concern.

2. Mention the various types of inquiries. (NOV/DEC 2015)

The three types of inquiries, in solving ethical problems are:

normative inquiry,

conceptual inquiry,

factual or descriptive inquiry.

3. What are the models of professional roles? (NOV/DEC 2014)

There are several role models to whom the engineers are attracted. These models provoke their thinking, attitudes and actions.

Savior

Guardian

Bureaucratic Servant

Social Servant

Social Enabler and Catalyst

Game Player

4. Define ethics. (NOV/DEC 2013)

Engineering ethics is defined by the codes and standards of conduct endorsed by engineering (professional) societies with respect to the

particular set of beliefs, attitudes and habits displayed by the individual or group.

5. What are the senses of engineering ethics? (NOV/DEC 2013)

There are two different senses (meanings) of engineering ethics, namely

Normative senses and

Descriptive senses.

6. Define moral dilemma. (April/May 2019)

Dilemmas are situations in which moral reasons come into conflict, or in which the application of moral values are problems, and one is not clear of the immediate choice or solution of the problems.

Moral reasons could be rights, duties, goods or obligations. These situations do not mean that things had gone wrong, but they only indicate the presence of moral complexity.

This makes the decision making complex.

7. Define 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 mean either 'utilities' or the 'balance of good over evil'. This approach weighs the costs and benefits. Right actions are the ones that produce the greatest satisfaction of the preferences of the affected persons.

8. Define Rights theory.

The RIGHTS approach to ethics has its roots in the 18th century philosopher Immanuel Kant, who focused on the individual's right to choose for oneself. According him, what makes human beings different from mere things is, that people have dignity based on their ability to choose freely what they will do with their lives, and they have a fundamental moral right to have these choices respected.

People are not objects to be manipulated; it is a violation of human dignity to use people in ways they do not freely choose.

9. Define self control and self interest.

Self control is a virtue of maintaining personal discipline. It means a strong will and motivation and avoidance of fear, hatred, lack of efforts, temptation, self-deception, and emotional response. It encompasses courage and good judgment also. Self-respect promotes self-control.

Self-interest is being good and acceptable to oneself. It is pursuing what is good for oneself. It is very ethical to possess self-interest. As per utilitarian theory, this interest should provide for the respect of others also.

10. What are the uses of ethical theory. (APRIL/MAY 2017/2018)

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 relating ordinary and professional morality.

11. Define custom

Ethical Pluralism: Various cultures in our pluralistic society lead to tolerance for various customs, beliefs, and outlooks. Accordingly ethical pluralism also exists. Although many moral attitudes appear to be reasonable, the rational and morally concerned people can not fully accept any one of the moral perspectives.

Ethical Relativism: According to this principle, actions are considered morally right when approved by law or custom, and wrong when they violate the laws or customs. The deciding factor is the law or the customs of the society.

12. Define religion

Religions have played major roles in shaping moral views and moral values, over geographical regions. Christianity has influenced the Western countries, Islam in the Middle-East countries, Buddhism and Hinduism in Asia, and Confucianism in China. Further, there is a strong psychological link between the moral and religious beliefs of

people following various religions and faiths. Religions support moral responsibility. They have set high moral standards.

13. Define Consensus and Controversy.

Consensus means agreement. Controversy means conflicts or disagreement.

14. What are all the senses of engineering ethics?

There are two different senses (meanings) of engineering ethics, namely the Normative and the Descriptive senses. The normative sense include:

(a) Knowing moral values, finding accurate solutions to moral problems and justifying moral judgments in engineering practices,

(b) Study of decisions, policies, and values that are morally desirable in the engineering practice and research, and

(c) Using codes of ethics and standards and applying them in their transactions by engineers.

The descriptive sense refers to what specific individual or group of engineers believe and act, without justifying their beliefs or actions.

15. Variety of moral issues.

1.Resource Crunch

2. Opportunity

3. Attitude

16. Define 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 (e.g., before the elections), reduction in the budget because of sudden war or natural calamity (e.g., Tsunami) and obsolescence due 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.

17. Define Opportunity

(a) Double standards or behavior 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 projecting their own interests 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 best encountered by developing policies that allow 'conscience keepers' and whistle blowers and appointing ombudsman, who can work confidentially with people to solve the unethical problems internally.

18. Define poor attitude

Poor attitude of the employees set in due to

(a) Low morale of the employees because of dissatisfaction 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.

19. Define 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 judgments. 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 practices of their employers?

3. Whose values ought to be primary in making judgment about acceptable risks in design for a public transport system or 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?

20. Define 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 interconnected.

21. Define 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 alterative 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?

22. What are all the problems in moral dilemma.

1. The problem of vagueness: One is unable to distinguish between good and bad (right or wrong) principle. Good means an action that is obligatory. For example, code of ethics specifies that one should obey the laws and follow standards. Refuse bribe or accept the gift, and maintain confidentiality

2. The problem of conflicting reasons: One is unable to choose between two good moral solutions. One has to fix priority, through knowledge or value system.

3. The problem of disagreement: There may be two or more solutions and none of them mandatory. These solutions may be better or worse in some respects but not in all aspects. One has to interpret, apply different morally reasons, and analyze and rank the decisions. Select the best suitable, under the existing and the most probable conditions.

23. What are all the engineering skills related to moral autonomy.

1. Proficiency in recognizing moral problems in engineering and ability to distinguish as well as relate them to problems in law, economics, and religion,

2. Skill in comprehending, clarifying, and critically-assessing arguments on different aspects of moral issues,

3. Ability to form consistent and comprehensive view points based on facts,

4. Awareness of alternate responses to the issues and creative solutions for practical difficulties,

5. Sensitivity to genuine difficulties and subtleties, including willingness to undergo and tolerate some uncertainty while making decisions,

6. Using rational dialogue in resolving moral conflicts and developing tolerance of different perspectives among morally reasonable people, and

7.Maintaining moral integrity.

24. Define Kohlberg Theory

Moral development in human being occurs overage 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.

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.

25. Define pre-conventional ,conventional ,post-conventional levels in Kohlberg theory.

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.

26. Define 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, overriding other rules. In contrast, women gave importance to preserve personal relationships with all the people 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.

27. Define pre-conventional ,conventional ,post-conventional levels in gilligan's theory.

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.

28. What are all the criteria for achieving and sustaining professional status or professionalism. (April/May 2018)

1. Advanced expertise: The expertise includes sophisticated skills and theoretical knowledge in exercising judgment. This means a professional should analyse the problem in specific known area, in an objective manner.

2. Self-regulation: One should analyse the problem independent of self-interest and direct to a decision towards the best interest of the clients/customers. An autonomous judgment (unbiased and on merits only) is expected. In such situations, the codes of conduct of professional societies are followed as guidance.

3. Public good: One should not be a mere paid employee of an individual or a teaching college or manufacturing organization, to execute whatever the employer wants one to do. The job should be recognised by the public. The concerted efforts in the job should be towards promotion of the welfare, safety, and health of the public.

29. Define Monopoly

The monopoly control is achieved in two ways:

(a) The profession convinces the community that only those who have graduated from the professional school should be allowed to hold the professional title. The profession also gains control over professional schools by establishing accreditation standards

(b) By persuading the community to have a licensing system for those who want to enter the profession. If practicing without license, they are liable to pay penalties.

30. What are all the different senses of responsibilities?

1. Characteristic Quality
2. Obligations
3. General Moral Capacity
4. Liability and Accountability
5. Praiseworthiness/Blameworthiness

31. Define Accountability

Accountability means:

1. The capacity to understand and act on moral reasons
2. Willingness to submit one's actions to moral scrutiny and be responsive to the assessment of others. It includes being answerable for meeting specific obligations, i.e., liable to justify (or give reasonable excuses) the decisions, actions or means, and outcomes (sometimes unexpected), when required by the stakeholders or by law.

32. Define Conscientiousness

It means:

(a) Being sensitive to full range of moral values and responsibilities and

(b) The willingness to upgrade their skills, put efforts, and reach the best balance possible among those considerations.

33. Define corporate responsibility and corporate accountability.

The terms 'corporate responsibility' and 'corporate accountability' have different meanings. Corporate responsibility emphasizes the voluntary compliance of a particular organization to particular codes of conduct. The groups of individuals in the organization are assigned responsibilities through policy manuals and flow charts. The corporate accountability means holding all the corporate organizations accountable to the public, employees, customers, and stock holders, as empowered by rules and laws.

34. What are all the safety and other obligations of professional engineers.

1. Moral obligations through laws and enforced codes of conduct
2. Through membership of professional society
3. Contractual agreement with the employers
4. By entry into career as engineer upon graduation from Engineering institutions and
5. By special employment agreements or agreement with professional societies.

The *paramount obligation* means, giving importance to the safety, health, and welfare of the public in performing the professional duties.

35. What are all the 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 depend, 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 (judgments) 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.

PART B

1. Explain the gillian's theory for moral development.
(NOV/DEC 2015) (APRIL/MAY 2017)

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, overriding other rules. In contrast, women gave importance to preserve personal relationships with all the people 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.

Basic aspects:

1. Is based on the study on men and women
2. Women always want to keep up the personal relationships with all the persons involved in the situations.
3. Women give attention to circumstances leading to critical situations rather than rules: (context-oriented and ethics of care) characteristic features
    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

Gilligan however attributed the decision by women as context-oriented and not on the basis of rules ranked in the order of priority.

2. What are the different types of models of professional roles.
(April/May 2018)(NOV/DEC 2015)

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 provoke 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 Servant

He serves the organization and the employers. The management of an enterprise fixes its goals and assigns the job of problem solving to the

engineer, who accepts 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.Viswesvarayya.

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 Sundarlal 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 voice. 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. Kasthurirangan, ISRO.

3. Explain the theory of human right ethics and its classification.
(NOV/DEC 2015)

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 18th century philosopher **Immanuel Kant**, who focused on the individual's right to choose for oneself. According him, what makes human beings different from mere things is, that people have dignity based on their ability to choose freely what they will do with their lives, and they have a fundamental moral right to have these choices respected. People are not objects to be manipulated; it is a violation of human dignity to use people in ways they do not freely choose. Other rights he advocated are:

1. *The right to access the truth*: We have a right to be told the truth and to be informed about matters that significantly affect our choices.
2. *The right of privacy*: We have the right to do, believe, and say whatever we choose in our personal lives so long as we do not violate the rights of others.
3. *The right not to be injured*: We have the right not to be harmed or injured unless we freely and knowingly do something to deserve punishment or we freely and knowingly choose to risk such injuries.
4. *The right to what is agreed*: We have a right to what has been promised by those with whom we have freely entered into a contract or agreement.

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 views were reflected in the modern American society, when Jefferson declared the basic rights as life, liberty, and pursuit of happiness.

C. As per **A.I. Melden's** theory based on rights, nature mandates that we should not harm others' life, health, liberty or property. Melden allowed welfare rights also for living a decent human life. He highlighted that the rights should be based on the social welfare system.

D. *Human rights*: Human rights are explained in two forms, namely liberty rights and welfare rights. Liberty rights are rights to exercise one's liberty and stresses 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 since 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.

The Welfare Rights are the rights to benefit the needy for a decent human life, when one can not earn those benefits and when those benefits are available in the society. E. *Economic rights*: In the free-market economy, the very purpose of the existence of the manufacturer, the sellers and the service providers is to serve the consumer. The consumer is eligible to exercise some rights9. The consumers' six basic rights are: Right to Information, Right to Safety, Right to Choice, Right to be Heard, Right to Redressal, and Right to Consumer Education.

4. What is meant by self interest? Relate the term with ethical egoism with suitable example. (APRIL/MAY 2017) (NOV/DEC 2015)

Self-interest is being good and acceptable to oneself. It is pursuing what is good for oneself. It is very ethical to possess self-interest. As per utilitarian theory, this interest should provide for the respect of others also. Duty ethics recognizes this aspect as duties to ourselves.

Then only one can help others. Right ethicist stresses our rights to pursue our own good.

Virtue ethics also accepts the importance of self-respect as link to social practices.

In Ethical Egoism, the self is conceived in a highly individualistic manner. It says that every one of us should always and only promote one's own interest.

The ethical egoists do not accept the well being of the community or caring for others. However this self interest should not degenerate into egoism or selfishness, i.e., maximizing only own good in the pursuit of self-interest.

The ethical egoists hold that the society benefits to maximum when

(a) the individuals pursue their personal good and

(b) the individual organizations pursue maximum profit in a competitive enterprise.

This is claimed to improve the economy of the country as a whole, besides the individuals.

In such pursuits, both individuals and organizations should realize that independence is not the only important value.

We are also interdependent, as much as independent. Each of us is vulnerable in the society.

Self-respect includes recognition of our vulnerabilities and interdependencies. Hence, it is compatible with caring for ourselves as well as others.

Self-interest is necessary initially to begin with. But it should be one of the prime motives for action; the other motive is to show concern for others, in the family as well as society. One's self-interest should not harm others. The principles of 'Live and let (others) live', and 'reasonably fair competition' are recommended to professionals by the ethicists.

5. Write a brief notes on the types of inquiries. (APRIL/MAY 2015)

(April/May 2019)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 judgments. 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 practices of their employers?
3. Whose values ought to be primary in making judgment about acceptable risks in design for a public transport system or 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 interconnected.

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 alterative 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?

6. Discuss in detail about uses and limitation of ethical theories.
(April/May 2018)(APRIL/MAY 2015)

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 relating 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 depend, 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 (judgments) 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 on their emphasis. But they remain complementary always.

7. Describe Kohlberg and gillegan's theory on moral autonomy.
(APRIL/MAY 2015)
(APRIL/MAY 2017/2018)
(April/May 2019)

1. Kohlberg theory

Moral development in human being occurs overage 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, overriding other rules. In contrast, women gave importance to preserve personal relationships with all the people 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.

Kohlberg theory	Gillegan's theory
Basic aspects	Basic aspects
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	**Characteristic Features**
1. Justice	1. Reason
2. Factual	2. Emotional
3. Right or wrong	3. Impact on relationships
4. Logic only	4. Compassion too
5. Logic and rule-based	5. Caring and concern
6. Less of caring	6. More of caring
7. Matter of fact (practical)	7. Abstract
8. Present focus	8. Future focus
9. Strict rules	9. Making exceptions
10. Independence	10. Dependence
11. Rigid	11. Human-oriented
12. Taking a commanding role	12. Shying away from decision-making
13. Transactional approach	13. Transformational approach

8. Explain the skills needed to handle problems about moral issues in engineering ethics. (NOV/DEC 2014)

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 (e.g., before the elections), reduction in the budget because of sudden war or natural calamity (e.g., Tsunami) and obsolescence due 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 behavior 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 projecting their own interests 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 best encountered by developing policies that allow 'conscience keepers' and whistle blowers and appointing ombudsman, who can work confidentially with people 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 dissatisfaction 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.

9. Explain the need of tolerance for different customs and ethical pluralism in a diverse society with suitable example. (APRIL 2014)

Ethical Pluralism: Various cultures in our pluralistic society lead to tolerance for various customs, beliefs, and outlooks. Accordingly ethical pluralism also exists. Although many moral attitudes appear to be reasonable, the rational and morally concerned people can not fully accept any one of the moral perspectives.

There are many varied moral values, which allow variation in the understanding and application of values by the individuals or groups in their everyday transactions. It means that even reasonable people will not agree on all moral issues and professional ethics.

Ethical Relativism:

According to this principle, actions are considered morally right when approved by law or custom, and wrong when they violate the laws or customs. The deciding factor isthe law or the customs of the society. Should we accept the principle of relativism or not? A few reasons to accept this are explained in the following paragraphs:

1. Laws appear to be objective ways for judging values. The laws and customs tend to be definite, clear and real, but not always. Further moral reasons allow objective criticism of laws, as being morally lacking.

For example, the Apartheid laws of South Africa violated the human rights of the native Africans. No legal protection was available for native citizens for a long time. Now, of course, these laws have been repealed.

2. Ethical relativism assumes that the values are subjective at the cultural level. Moral standards also vary from culture to culture. The objectivity is supported by the existing laws of that society.

The relative morality accepted, supports the virtue of tolerance of differences among societies. This argument is also not fully acceptable.

As per ethical relativism, the actions and laws of the Nazis and Hitler who vowed on Anti-Semitism and killed several million Jews would be accepted as right.

3. Moral relationalism or moral contextualism: According to this, the moral judgments must be made in relation to certain factors, which may vary from case to case. The morally important factors for making judgments include the customs and laws.

The virtue ethicists hold that the practical wisdom should prevail upon assessing the facts and in the judgment. This principle was accepted by the early anthropologists because they had a specific tendency to over-stress the scope of moral difference between cultures.

The human sacrifices and cannibalism were accepted. But the modern anthropologists insist that all cultures shall exhibit the virtue of social welfare and safety against needless death or physical or mental harm. Moral differences were based on the circumstances and facts and not on the difference in moral attitudes. For example, the pharaohs buried the live attendants along with their dead king with the belief that they would continue to serve the king in his after life.

10. Mention the different types of ethical theories. (NOV/DEC 2013) (April/May 2019)

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 mean either 'utilities' or the 'balance of good over evil'. This approach weighs the costs and benefits. Right actions 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:

(a) Identify the various courses of action available to us.

(b) Ask who will be affected by each action and what benefits or harms will be derived from each.

(c) Choose the action that will produce the greatest benefits and the least harm. The ethical action is the one that provides the greatest good for the greatest number.

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 steal', 'do no harm others', 'do not bribe', as of primary importance. He suggested that individual actions are right when they are required by set of rules which maximizes the public good.

The act utilitarian theory permitted a few immoral actions. Hence, there was need to develop rule *utilitarian theory to* establish morality and justice, in the transactions. For example, stealing an old computer from the employer will benefit the employee more than the loss to the employer. As per Act, utilitarian this action is right. But rule utilitarian observes this as wrong, because the employee should act as 'faithful agent or trustee of the employees'. In another example, some undisciplined engineers are terminated with the blame for the mistakes they have not committed. 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 week', 'being grateful', 'keeping promises' etc. The stress is on the universal principle of respect for autonomy i.e., respect and rationality of persons. As per Kant we have duties to ourselves, as we are rational and autonomous beings. We have a duty not to commit suicide; a duty to develop our talents and a duty to avoid harmful drugs. Kant insisted that moral duties are categorical imperatives.

They are commands that we impose on ourselves as well as other rational beings. For example, we should be honest because honesty is required by duty. A businessman is to be honest because honesty pays — in terms of profits from customers and from avoiding jail for dishonesty.

B. On the other hand, the DUTY ethics theory, as enunciated by **John Rawl**, gave importance to the actions that would be voluntarily agreed upon by all persons concerned, assuming impartiality. His view emphasized the autonomy each person exercises in forming agreements with other

rational people. Rawl proposed two basic moral principles; (1) each person is entitled to the most extensive amount of liberty compatible with an equal amount for others, and (2) differences in social power and economic benefits are justified only when they are likely to benefit every one, including members of the most disadvantaged groups. The first principle is of prime importance and should be satisfied first. Without basic liberties other economic or social benefits can not be sustained for long. The second principle insists that to allow some people with great wealth and power is justified only when all other groups are benefited. In the business scenario, for example, the free enterprise is permissible so far it provides the capital needed to invest and prosper, thereby making job opportunities to the public and taxes to fund the government spending on the welfare schemes on the poor people.

3. Rights Theory(APRIL/MAY 2017)

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 18th century philosopher **Immanuel Kant**, who focused on the individual's right to choose for oneself. According him, what makes human beings different from mere things is, that people have dignity based on their ability to choose freely what they will do with their lives, and they have a fundamental moral right to have these choices respected. People are not objects to be manipulated; it is a violation of human dignity to use people in ways they do not freely choose. Other rights he advocated are:

1. *The right to access the truth*: We have a right to be told the truth and to be informed about matters that significantly affect our choices.
2. *The right of privacy*: We have the right to do, believe, and say whatever we choose in our personal lives so long as we do not violate the rights of others
3. *The right not to be injured*: We have the right not to be harmed or injured unless we freely and knowingly do something to deserve punishment or we freely and knowingly choose to risk such injuries.
4. *The right to what is agreed*: We have a right to what has been promised by those with whom we have freely entered into a contract or agreement.

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 views were reflected in the modern American society, when Jefferson declared the basic rights as life, liberty, and pursuit of happiness.

C. As per **A.I. Melden's** theory based on rights, nature mandates that we should not harm others' life, health, liberty or property. Melden allowed welfare rights also for living a decent human life. He highlighted that the rights should be based on the social welfaresystem.

D. *Human rights*: Human rights are explained in two forms, namely liberty rights and welfare rights. Liberty rights are rights to exercise one's liberty and stresses 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 since 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.

The Welfare Rights are the rights to benefit the needy for a decent human life, when one cannot earn those benefits and when those benefits are available in the society.

E. *Economic rights*: In the free-market economy, the very purpose of the existence of the manufacturer, the sellers and the service providers is to serve the consumer. The consumer is eligible to exercise some rights9. The consumers' six basic rights are: Right to Information, Right to Safety, Right to Choice, Right to be Heard, Right to Redressal, and Right to Consumer Education.

4. The Virtue Theory

This emphasizes on the character rather than the rights or duties. The character is the pattern of virtues (morally-desirable features). 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'.

5. Self-realisation Ethics

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

11. Write short notes on Moral Autonomy. (NOV/DEC 2013)

Moral autonomy is defined as, decisions and actions exercised on the basis of moral concern for other people and recognition of good moral reasons. Alternatively, moral autonomy means 'self determinant or independent'. The autonomous people hold moral beliefs and attitudes based on their critical reflection rather than on passive adoption of the conventions of the society or profession. Moral autonomy may also be defined as a skill and habit of thinking rationally about the ethical issues, on the basis of moral concern.

Viewing engineering as social experimentation will promote autonomous participation and retain one's professional identity. Periodical performance appraisals, tight-time schedules and fear of foreign competition threatens this autonomy. The attitude of the management should allow latitude in the judgments of their engineers on moral issues. If management views *profitability* is more important than *consistent quality and retention of the customers* that discourage the moral autonomy, engineers are compelled to seek the support from their professional societies and outside organizations

for moral support. It appears that the blue-collar workers with the support of the union can adopt better autonomy than the employed professionals. Only recently the legal support has been obtained by the professional societies in exhibiting moral autonomy by professionals in this country as well as in the West.

The engineering skills related to moral autonomy are listed as follows:

1. Proficiency in recognizing moral problems in engineering and ability to distinguish as well as relate them to problems in law, economics, and religion,
2. Skill in comprehending, clarifying, and critically-assessing arguments on different aspects of moral issues,
3. Ability to form consistent and comprehensive view points based on facts,
4. Awareness of alternate responses to the issues and creative solutions for practical difficulties,
5. Sensitivity to genuine difficulties and subtleties, including willingness to undergo and tolerate some uncertainty while making decisions,
6. Using rational dialogue in resolving moral conflicts and developing tolerance of different perspectives among morally reasonable people, and
7. Maintaining moral integrity

Autonomy which is the independence in making decisions and actions, is different from authority. Authority provides freedom for action, specified within limits, depending on the situation.

Moral autonomy and respect for authority can coexist. They are not against each other. If the authority of the engineer and the moral autonomy of the operator are in conflict, a consensus is obtained by the two, upon discussion and mutual understanding their limits.

12. Write short notes of moral dilemma.

Dilemmas are situations in which moral reasons come into conflict, or in which the application of moral values are problems, and one is not clear of the immediate choice or solution of the problems.

Moral reasons could be rights, duties, goods or obligations. These situations do not mean that things had gone wrong, but they only indicate the presence

of moral complexity. This makes the decision making complex.

For example, a person promised to meet a friend and dine, but he has to help his uncle who is involved in an accident — one has to fix the priority.

There are some difficulties in arriving at the solution to the problems, in dilemma. The three complex situations leading to moral dilemmas are:

1. The problem of *vagueness*: One is unable to distinguish between good and bad (right or wrong) principle. Good means an action that is obligatory. For example, code of ethics specifies that one should obey the laws and follow standards. Refuse bribe or accept the gift, and maintain confidentiality

2. The problem of *conflicting reasons*: One is unable to choose between two good moral solutions. One has to fix priority, through knowledge or value system.

3. The problem of *disagreement*: There may be two or more solutions and none of them mandatory. These solutions may be better or worse in some respects but not in all aspects.

One has to interpret, apply different morally reasons, and analyze and rank the decisions.

Select the best suitable, under the existing and the most probable conditions.

Steps to Solve Dilemma

The logical steps in confronting moral dilemma are:

1. Identification of the moral factors and reasons. The clarity to identify the relevant moral values from among duties, rights, goods and obligations is obtained (conceptual inquiry).

The most useful resource in identifying dilemmas in engineering is the professional codes of ethics, as interpreted by the professional experience. Another resource is talking with colleagues who can focus or narrow down the choice of values.

2. Collection of all information, data, and facts (factual inquiry) relevant to the situation.

3. Rank the moral options i.e., priority in application through value system, and also as obligatory, all right, acceptable, not acceptable, damaging, and most damaging etc.

For example, in fulfilling responsibility, the codes give prime importance to public safety and protection of the environment, as compared to the individuals or the employers (conceptual inquiry).

4. Generate alternate courses of action to resolve the dilemma. Write down the main options and sub-options as a matrix or decision tree to ensure that all options are included.

5. Discuss with colleagues and obtain their perspectives, priorities, and suggestions on various alternatives.

6. Decide upon a final course of action, based on priority fixed or assumed. If there is no ideal solution, we arrive at a partially satisfactory or 'satisficing' solution.

13. Explain in detail about variety of moral issues

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 (e.g., before the elections), reduction in the budget because of sudden war or natural calamity (e.g., Tsunami) and obsolescence due 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 behavior 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 projecting their own interests 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 best encountered by developing policies that allow 'conscience keepers' and whistle blowers and appointing ombudsman, who can work confidentially with people to solve the unethical problems internally.

3. Attitude

(a) Poor attitude of the employees set in due to Low morale of the employees because of dissatisfaction 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 9.

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

14. Explain in details about the senses of Engineering Ethics.

SENSES OF 'ENGINEERING ETHICS'

The word ethics has different meanings but they are correspondingly related to each other. In connection with that, Engineering ethics has also various senses which are related to one another.

SENSES OF EXPRESSION OF ENGG. ET HICS

⇨ Ethics is an activity and area of inquiry. It is the activity of understanding moral values, resolving moral issues and the area of study resulting from that activity.

⇨ When we speak of ethical problems, issues and controversies, we mean to distinguish them from non moral problems.

⇨ Ethics is used to refer to the particular set of beliefs, attitudes and habits that a person or group displays concerning moralities.

Comparison of the senses of Ethics and Engineering Ethics

Ethics	Engineering Ethics
1. Ethics is an activity which concerns with making investigations and knowing about moral values, finding solutions to moral issues and justifying moral issues and justifying moral judgments.	1. Like the ethics, engineering ethics also aims at knowing moral values related to engineering, finding accurate solutions to the moral problems in engineering and justifying moral judgments of engineering.
2. Ethics is a means of contrasting moral questions from non-moral problems.	2. Engineering Ethics gives a total view of the moral problems and how to solve these issues specifically related to engineering field.
3. Ethics is also used as a means of describing the beliefs, attitudes and Habits related to an individual and group morality eg:Ethics given in the Bhagavat Gita or the Bible or the Quran.	3. Engineering ethics is also using some currently accepted codes and standards which are to be followed by group of engineers and engineering societies.
4. As per the definition of dictionaries Moral principles is about the action and principles of conduct of the people. i.e. ethical or unethical.	4. Engineering ethics also concerns with discovering moral principles such as obligation, rights and ideals in engineering and by applying them to take a correct decision.

From these senses of Engineering ethics, one can realize that it is the study of morality.

15. Discuss in details about Kohlbergs Theory. (Nov 2015)

KOHLBERG'S THEORY

Moral Autonomy is based on the psychology of moral development. The first Psychological theory was developed by Jean Piaget.On the basis of piaget's theory and Lawrence kohlberg developed three main levels of moral development which is based on the kinds of reasoning and motivation adopted by individuals with regard to moral questions.

The Pre Conventional Level

It is nothing but self-centered attitude. In this level, right conduct is very essential for an individual which directly benefits him. According to this level,individuals are motivated by their willingness to avoid punishment, or by their desire to satisfy their own needs or by the influence of the power exerted by them. This level is related to the moral development of children and some adults who nev er Want to go beyond a certain limit.

The Conventional Level

The level deals with the respect for conventional rules and authorit y. As per this Level the rules and norms of one's family or group or society has been accepted as the final standard of morality. These conventions are regarded as correct, because they represent with authority. When individuals are under this level, always want to please/satisfy others and also to meet the expectations of the society and not their self-interest. Loyalty and close identification with others have been given much importance. No adult tries to go beyond this level.

The Post Conventional Level

This level is said to be attained when an individual recognizes the right and the wrong on the basis of a set of principles which governing rights and the general good which are not based on self-int erest or social conventions. These individuals are called "autonomous", because they only think for themselves and also they do not agree that customs are always correct. They want to live by general principles which are universally applied to all people. They always want to maint ain their moral integrity, self-respect and the respect for other autonomous peoples.

As per Kohlberg's view only few people would reach the post conventional level which is based on assumption that movement towards autonomous is morally desirable.

16. Explain about a) Consensus and Controversy (8 Marks)

CONSENSUS AND CONTROVERSY

Consensus means "Agreement and controversy",means disagreement. The consensus and the controversies are playing the vital roles while considering the moral autonomy.

When an individual exercises the moral autonomy, he cannot get the same results as others get in applying moral autonomy. Surely there must be some moral differences i.e. the results or verdicts will be of controversy. This kind of disagreements is unavoidable. These disagreements require some tolerances among individuals those who are autonomous, reasonable and responsible.

As per the principle of tolerance, the goal of teaching engineering ethics is not merely producing an agreed conformit y on applying moral principles among engineers but also to reveal the ways of promoting tolerances to apply moral autonomy.

Both the goals of engineering ethics and the goals of engineering courses have some similarities. These similarities have to be extended with the help of exercising authorit y. For example, in the class room, the teachers are having the authorit y over students and in the work place, the managers are having the authority over engineers.

There are two general points regarding the relat ionship between autonomy and authority with reference to the class room:

1) Moral autonomy and respect for the authority cannot be differentiated or separated from each other. Moral autonomy is exercised on the basis of moral concern for other people and also recognition of good moral reasons. Authority provides for the framework in which learning can take place. It is based on the acceptance of authorit y by both the students and the professors. Without this acceptance, the classes cannot be conducted in a smooth way.

On the other hand, cheating will be encouraged and the trust between facult y and the students may be reduced to some extent. These kind of deviations are due to the absence of moral views and respect for authority. They must be coincide with each other.

2) Generally a tension may arise amo ng the individuals regarding the need for consensus about authority and need for autonomy. This tension

can be reduced by discussing openly regarding a moral issue between students and facult y with the help of the authority.

In short, conflicts will arise between autonomy and authorit y, when the authority is misused. For example, in small classes, the students are having the authorit y to express their own views. But the Professor does not allow them to do so, he misuses his authority. This will create some moral problems between the students and the faculty.

UNIT - 3

ENGINEERING AS SOCIAL EXPERIMENTATION

PART A

1. What is the importance of experimentation? (APRIL/MAY 2017/2018)

Experimentation is commonly recognized to play an essential role in the design process. Preliminary tests or simulations are conducted from the time it is decided to convert a new engineering concept into its first rough design. Materials and processes are tired out, usually employing formal experimentation techniques. Such tests serve as the basis for more detailed designs, which in turn are tested.

2. List some of the importance of learning from the past.

This might be expected that engineers would learn not only from their own earlier design and operating results, but also from those of other engineers. Unfortunately, that is frequently not the case. Lack of established channels of communication, misplaced pride is not asking for information, embracement at failure or fear of litigation and plain neglect often impede flow of such information and lead to many repetitions of past mistakes.

3. What is meant by valid consent? (NOV 2011)

A consent, which has been given voluntarily, is known as valid consent. Valid consent is also defined as consent based on the information a rational person would want together with any other requested information to make a rational decision.

4. What are the responsibilities of engineers to society?

Some of the responsibilities of engineers to society are Primary obligations to protect the safety of human subjects and respect their right of consent.

A consent awareness of the experimental nature of any project, imaginative forecasting of its possible side effects and a reasonable effort to monitor them. Autonomous, personal involvement in all steps of the projects. Accepting accountability for the results of a project.

5. What are the types of Standards?

Standards can be classified based on the following criteria's, namely

- Uniformity of physical properties and functions.
- Safety and reliability
- Quality of the products
- Use of accepted procedures
- Separability

6. What is meant by industrial standards?

Standards consist of explicit specification that, when followed with care, ensure that stated criteria for interchangeability and quality will be attained. Example ranges from automobile type size or load ratings of computer language.

7. List out the advantages of industrial standards.

(MAY/JUNE 2015)

Advantages of industrial standards are It facilitates the interchange of components They serve as ready-made substitutes for lengthy design specifications They decrease production costs Gives a competitiveness among the manufacturers.

8. What do you understand by standard experiments?

Experimentation is commonly recognized to essential role in the design process. Preliminary tests or simulations are conducted from the time it is decided to convert a new engineering concept into its first round design.

9. Define: Conscientiousness.

Conscientiousness means sense of awareness or consciousness. People act responsibly based on the extent of their Conscientiousness. Conscientiousness means commitment or responsibility required in a situation.

Engineering is a responsible profession, so the engineers must be very Conscientiousness in their profession while maintaining a full control of the given situation, know what good or bad takes place.

10. Define: Accountability.

The people those who feel their responsibility always accepts the entire blame for their actions. In short, it is known as accountability, which means being culpable (guilty) and hold responsible for faults and respond to the assessment of others. Accountable persons will conduct themselves based on the specific circumstances.

11. List some function of codes.

The functions of codes are

- Inspiration and Guidance
- Support
- Education and Mutual Understanding
- Public Image
- Protecting the Status
- Protecting Business Interest

12. What are the moral problems in engineering due to minimal compliance? (NOV 2012)

Minimal compliance can find its expression when companies or individuals search for loopholes in the law that will allow them to barely keep to its letter even when violating its sprits

13. Define Engineering Ethics(APRIL/MAY 2017) (MAY 2013)(NOV 2013) Engineering ethics is the study of moral issues and decisions confront- ing individuals and organizations involved in engineering and the study of related questions about moral conduct, character, ideals and relationships of peoples and organizations involved in technological development

14. What do you understand by "a balanced outlook on law"? (MAY 2013)

In order to live, work, and play together in harmony as a society, we need to carefully balance individual needs and desires against collective needs and desires. This is done to obtain ethical conduct. Ethical conduct defines a strong element of altruism, provides such a balance.

15. What are the limitation of codes of ethics.(April/May 2018) (NOV/DEC 2015)

1. General and vague wordings. Many statements are general in nature and hence unable to solve all problems.

2. Not applicable to all situations. Codes are not sacred, and need not be accepted without criticism. Tolerance for criticisms of the codes themselves should be allowed.

3. Often have internal conflicts. Many times, the priorities are clearly spelt out, e.g., codes forbid public remarks critical of colleagues (engineers), but they actually discovered a major bribery, which might have caused a huge loss to the exchequer.

4. They can not be treated as final moral authority for professional conduct. Codes have flaws by commission and omission. There are still some grey areas undefined by codes. They can not be equated to laws. After all, even laws have loopholes and they invoke creativity in the legal practitioners.

5. Only a few enroll as members in professional society and non-members can not be compelled.

6. Even as members of the professional society, many are unaware of the codes.

16. What are the conditions are essential for a valid informed consent. (NOV/DEC 2015)

For a valid consent, the following conditions are to be fulfilled:

1. Consent must be voluntary

2. All relevant information shall be presented/stated in a clearly understandable form

3. Consenter shall be capable of processing the information and make rational decisions.

4. The subject's consent may be offered in proxy by a group that represents many subjects of like-interests

17. What are the features of engineering experimentation. (NOV/DEC 2014)

1. Design

2.Fabrication, Assembly, physical Tests, Simulation

3.Prototype, Pilot Plant, Model Study

4.Final Design

5.Manufacture

6.Field Study.

18. Why the engineers are considered as responsible experimenters. (MAY/JUNE 2015)

Although the engineers facilitate experiments, they are not alone in the field. Their responsibility is shared with the organizations, people, government, and others. No doubt the engineers share a greater responsibility while monitoring the projects, identifying the risks, and informing the clients and the public with facts. Based on this, they can take decisions to participate or protest or promote.

The engineer, as an experimenter, owe several responsibilities to the society, namely,

1. A conscientious commitment to live by moral values.
2. A comprehensive perspective on relevant information. It includes constant awareness of the progress of the experiment and readiness to monitor the side effects, if any.
3. Unrestricted free-personal involvement in all steps of the project/ product development (autonomy).
4. Be accountable for the results of the project (accountability).

19. Define codes of ethics.

The 'codes of ethics' exhibit, rights, duties, and obligations of the members of a profession and a professional society.

20. Define Moral Autonomy.

This topic entirely covers the personal involvement in ones activity. Nowadays people are very much genuine to their personal activities. Moral beliefs and attitudes have to be incorporated in ones personal life so that he can take a committed action to any situations.

When engineering as seen as a social experimentation it helps to keeps a sense of autonomous participation in ones work. An engineer as an experimenter is undergoing training which helps to form his identity as

a professional, it leads to know about the current economic and safety standards. This also involves a greater sense of personal involvement in ones work.

PART B

1. What are the different roles and functions of codes of ethics. (April/May 2019)**(NOV/DEC 2015)** (APRIL/MAY 2017)

The 'codes of ethics' exhibit, rights, duties, and obligations of the members of a profession and a professional society. The codes exhibit the following essential roles:

1. *Inspiration and guidance*. The codes express the collective commitment of the profession to ethical conduct and public good and thus inspire the individuals. They identify primary responsibilities and provide statements and guidelines on interpretations for the professionals and the professional societies.

2. *Support to engineers*. The codes give positive support to professionals for taking stands on moral issues. Further they serve as potential legal support to discharge professional obligations.

3. *Deterrence (discourage to act immorally)* and discipline (regulate to act morally). The codes serve as the basis for investigating unethical actions. The professional societies sometimes revoke membership or suspend/expel the members, when proved to have acted unethical. This sanction along with loss of respect from the colleagues and the society are bound to act as deterrent.

4. *Education and mutual understanding*. Codes are used to prompt discussion and reflection on moral issues. They develop a shared understanding by the professionals, public, and the government on the moral responsibilities of the engineers. The Board of Review of the professional societies *encourages moral discussion for educational purposes*.

5. *Create good public image.* The codes present positive image of the committed profession to the public, help the engineers to serve the public effectively. They promote more of self regulation and lessen the government regulations. This is bound to raise the reputation of the profession and the organization, in establishing the trust of the public.

6. *Protect the status quo*. They create minimum level of ethical conduct and

promotes agreement within the profession. Primary obligation namely the safety, health, and welfare of the public, declared by the codes serves and protects the public.

7. *Promotes business interests*. The codes offer inspiration to the entrepreneurs, establish shared standards, healthy competition, and maximize profit to investors, employees, and consumers.

2. Explain in detail about the powerful support and proper role of law in engineering. (NOV/DEC2015)

Proper role of a law

Good laws when enforced effectively produce benefits. They establish minimal standards of professional conduct and provide a motivation to people. Further they serve as moral support and defense for the people who are willing to act ethically. Thus, it is concluded that:

1. The rules which govern engineering practice should be construed as of responsible experimentation rather than rules of a game. This makes the engineer responsible for the safe conduct of the experiment.
2. Precise rules and sanctions are suitable in case of ethical misconduct that involves the violation of established engineering procedures, which are aimed at the safety and the welfare of the public.
3. In situations where the experimentation is large and time consuming, the rules must not try to cover all possible outcomes, and they should not compel the engineers to follow rigid courses of action.
4. The regulation should be broad, but make engineers accountable for their decisions, and
5. Through their professional societies, the engineers can facilitate framing the rules, amend wherever necessary, and enforce them, but without giving-in for conflicts of interest.

3. With a case study explain the learn from the past in engineering experimentation. (NOV/DEC2015)

The following codes are typical examples of how they were enforced in the past:

Code for Builders by Hammurabi

Hummurabi the king of Babylon in 1758 framed the following code for the builders:

"If a builder has built a house for a man and has not made his work sound and the house which he has built has fallen down and caused the death of the householder, that builder shall be put to death. If it causes the death of the householder's son, they shall put that builder's son to death.

If it causes the death of the householder's slave, he shall give slave for slave to the householder. If it destroys property, he shall replace anything it has destroyed; and because he has not made the house sound which he has built and it has fallen down, he shall rebuild the house which has fallen down from his own property.

If a builder has built a house for a man and does not make his work perfect and the wall bulges, that builder shall put that wall in sound condition at his own cost"

This code was expected to put in self-regulation seriously in those years.

Steam Boat Code in USA

Whenever there is crisis we claim that there ought to be law to control this. Whenever there is a fire accident in a factory or fire cracker's store house or boat capsize we make this claim, and soon forget.

Laws are meant to be interpreted for minimal compliance. On the other hand, laws when amended or updated continuously, would be counter productive. Laws will always lag behind the technological development. The regulatory or inspection agencies such as Environmental authority of India can play a major role by framing rules and enforcing compliance.

In the early 19th century, a law was passed in USA to provide for inspection of the safety of

boilers and engines in ships. It was amended many times and now the standards formulated by the

American Society of Mechanical Engineers are followed.

4. Compare and contrast engineering experiments with standard experiments.(April/May 2018) (NOV/DEC 2014)

The scientific experiments in the laboratory and the engineering experiments in the filed exhibit several contrasts as listed below:

1. Experimental control: In standard experiments, members for study are selected into two groups namely A and B at random. Group A are given special treatment. The group B is given no treatment and is called the 'controlled group'. But they are placed in the same environment as the other group A. This process is called the experimental control. This practice is adopted in the field of medicine. In engineering, this does not happen, except when the project is confined to laboratory experiments. This is because it is the clients or consumers who choose the product, exercise the control. It is not possible to make a random selection of participants from various groups. In engineering, through random sampling, the survey is made from among the users, to assess the results on the product. .
2. Humane touch: Engineering experiments involve human souls, their needs, views, expectations, and creative use as in case of social experimentation. This point of view is not agreed by many of the engineers. But now the quality engineers and managers have fully realized this humane aspect.
3. Informed consent: Engineering experimentation is viewed as Societal Experiment since the subject and the beneficiary are human beings. In this respect, it is similar to medical experimentation on human beings. In the case of medical practice, moral and legal rights have been recognized while planning for experimentation. Informed consent is practiced in medical experimentation. Such a practice is not there in scientific laboratory experiments.

Informed consent has two basic elements:

1. Knowledge: The subject should be given all relevant information needed to make the decision to participate.
2. Voluntariness: Subject should take part without force, fraud or deception. Respect for rights of minorities to dissent and compensation for harmful effect are assumed here.

For a valid consent, the following conditions are to be fulfilled:

1. Consent must be voluntary
2. All relevant information shall be presented/stated in a clearly understandable form

3. Consenter shall be capable of processing the information and make rational decisions.

4. The subject's consent may be offered in proxy by a group that represents many subjects of like-interests

Informed consent when bringing an engineering product to market, implies letting the customer know the following:

(a) the knowledge about the product

(b) risks and benefits of using the product and

(c)all relevant information on the product, such as how to use and how not to use (do's and don'ts). The relevant factual information implies, that the engineers are obliged to obtain and assess all the available information related to the fulfillment of one's moral obligations (i.e., wrong or immoral use of a product one designs), including the intended and unintended impacts of the product, on the society. Still there exists a possibility of a large gap of understanding between the experimenter and the subjects (public). Sometimes, the managements have not been willing to disseminate the full information about the project or product beyond the legal requirements, because of the fear of potential competitions and likely exposure to potential litigation.

People object to *involuntary risks* wherein the affected individual is neither a direct participant nor a decision maker. In short, we prefer to be the subjects of our own experiments rather than those of somebody else. If it is an asbestos plant or nuclear plant to be approved, affected parties expect their consent to be obtained. But they are ready to accept *voluntary* risks as in the case of stunts and amazing races.

In case of Koodangulam power project as well as the Sethusamudram Canal Project, Tamil Nadu, several citizen groups including Fishermen Forums have responded. The Central government was able contain many harsh apprehensions and protracted legal and political battles, by providing all relevant information.

4. *Knowledge gained*: Not much of new knowledge is developed in engineering experiments as in the case of scientific experiments in the laboratory. Engineering experiments at the most help us to

(a) verify the adequacy of the design,

(b) to check the stability of the design parameters, and

(c) prepare for the unexpected outcomes, in the actual field environments.

From the models tested in the laboratory to the pilot plant tested in the field, there are differences in performance as well as other outcomes.

5. **Explain in detail challenger accident.What are the etical problems involved in this.(April/May 2018) (NOV/DEC 2014).**

The orbiter of the Challenger had three main engines fuelled by liquid hydrogen. The fuel was carried in an external fuel tank which was jettisoned when empty. During lift-off, the main engines fire for about nine minutes, although initially the thrust was provided by the two booster rockets. These booster rockets are of the solid fuel type, each burning a million pound load of aluminum, potassium chloride, and iron oxide.

The casing of each booster rocket is about 150 feet long and 12 feet in diameter. This consists of cylindrical segments that are assembled at the launch site. There are four-field joints and they use seals consisting of pairs of O-rings made of vulcanized rubber. The O-rings work with a putty barrier made of zinc chromate.

The engineers were employed with Rockwell International (manufacturers for the orbiter and main rocket), **Morton-Thiokol** (maker of booster rockets), and they worked for NASA. After many postponements, the launch of Challenger was set for morning of Jan 28, 1986. **Allan J. McDonald** was an engineer from Morton-Thiokol and the director of the Solid Rocket Booster Project. He was skeptic about the freezing temperature conditions forecast for that morning, which was lower than the previous launch conditions. A teleconference between NASA engineers and MT engineers was arranged byAllan.

Arnold Thompson and **Roger Boisjoly**, the seal experts at MT explained to the other engineers how the booster rocket walls would bulge upon launch and combustion gases can blow past the O-rings of the field joints.

On many of the previous flights the rings have been found to have charred and eroded. In freezing temperature, the rings and the putty packing are less pliable. From the past data gathered, at temperature less than 65 °F the O-rings failure was certain. But these data were not deliberated at that conference as the launch time was fast approaching.

The engineering managers **Bob Lund** and **Joe Kilminster** agreed that there was a safety problem.

Boisjoly testified and recommended that no launch should be attempted with temperature less than 53 °F. These managers were annoyed to postpone the launch yet again. The top management of MT was planning for the renewal of contract with NASA, for making booster rocket. The managers told Bob Lund "to take-off the engineering hat and put on your management hat". The judgment of the engineers was not given weightage. The inability of these engineers to substantiate that the launch would be unsafe was taken by NASA as an approval by Rockwell to launch.

At 11.38 a.m. the rockets along with Challenger rose up the sky. The cameras recorded smoke coming out of one of the filed joints on the right booster rocket. Soon there was a flame that hit the external fuel tank. At 76 seconds into the flight, the Challenger at a height of 10 miles was totally engulfed in a fireball. The crew cabin fell into the ocean killing all the seven aboard.

Some of the factual issues, conceptual issues and moral/normative issues in the space shuttle challenger incident, are highlighted hereunder for further study.

Moral/Normative Issues

1. The crew had no escape mechanism. Douglas, the engineer, designed an abort module to allow the separation of the orbiter, triggered by a field-joint leak. But such a 'safe exit' was rejected as too expensive, and because of an accompanying reduction in payload.
2. The crew were not informed of the problems existing in the field joints. The principle of informed consent was not followed.
3. Engineers gave warning signals on safety. But the management group prevailed over and ignored the warning.

Conceptual Issues

1. NASA counted that the probability of failure of the craft was one in one lakh launches. But it was expected that only the 100000th launch will fail.
2. There were 700 criticality-1 items, which included the field joints. A failure in any one of them would have caused the tragedy. No back-up or stand-bye had been provided for these criticality-1 components.

Factual/Descriptive Issues

1. Field joints gave way in earlier flights. But the authorities felt the risk is not high.
2. NASA has disregarded warnings about the bad weather, at the time of launch, because they wanted to complete the project, prove their supremacy, get the funding from Government continued and get an applaud from the President of USA.
3. The inability of the Rockwell Engineers (manufacturer) to prove that the lift-off was unsafe. This was interpreted by the NASA, as an approval by Rockwell to launch.

6. Explain in briefly the role of industrial standard.

(APRIL/MAY 2015)

Industrial standards are important for any industry. Specification helps in achieving interchangeability. Standardization reduces the production costs and at the same time, the quality is achieved easily. It helps the manufacturer, customers and the public, in keeping competitiveness and ensuring quality simultaneously. Industrial standards are established by the Bureau of Indian Standards, in our country in consultation with leading industries and services.

International standards have become relevant with the development of the world trade. The International Standards Organization has now detailed specifications for generic products/services with procedures that the manufacturers or service providers should follow to assure the quality of their products or service. ISO 9000-2000 series are typical examples in this direction.

Aspects	Purpose	Examples
1. Quality	Value appropriate to price	Surface finish of a plate, life of a motor
2. Quality of service	Assurance of product to ISO procedures	Quality of degrees according institutions by educational institutions
3. Safety	To safeguard against injury or damage to property	Methods of waste disposal
4. Uniformity of physical properties and functions	Interchangeability, ease of assembly	Standard bolts and nuts, standard time

Aspects Purpose Examples

1. Quality Value appropriate to price Surface finish of a plate, life of a motor
2. Quality of service Assurance of product to ISO Quality of degrees according procedures institutions by educational institutions
3. Safety To safeguard against injury or Methods of waste disposal damage to property
4. Uniformity of Interchangeability, Standard bolts and physical properties ease of assembly nuts, standard and functions time

7. Explain the responsibilities of engineers to society.

(MAY/JUNE 2014)

Although the engineers facilitate experiments, they are not alone in the field. Their responsibility is shared with the organizations, people, government, and others. No doubt the engineers share a greater responsibility while monitoring the projects, identifying the risks, and informing the clients and the public with facts. Based on this, they can take decisions to participate or protest or promote.

The engineer, as an experimenter, owe several responsibilities to the society, namely,

1. A conscientious commitment to live by moral values.
2. A comprehensive perspective on relevant information. It includes constant awareness of the progress of the experiment and readiness to monitor the side effects, if any.
3. Unrestricted free-personal involvement in all steps of the project/product development (autonomy).
4. Be accountable for the results of the project (accountability).

Conscientiousness

Conscientious moral commitment means: (*a*) Being sensitive to full range of moral values and responsibilities relevant to the prevailing situation and (*b*) the willingness to develop the skill and put efforts needed to reach the best balance possible among those considerations. In short, engineers must possess open eyes, open ears, and an open mind (i.e., moral vision, moral listening, and moral reasoning).

This makes the engineers as social experimenters, respect foremost the safety and health of the affected, while they seek to enrich their knowledge, rush for the profit, follow the rules, or care for only the beneficiary. The human rights of the participant should be protected through voluntary and informed consent.

Comprehensive Perspective

The engineer should grasp the context of his work and ensure that the work involved results in only moral ends. One should not ignore his conscience, if the product or project that he is involved will result in damaging the nervous system of the people (or even the enemy, in case of weapon development)

A product has a built-in obsolete or redundant component to boost sales with a false claim. In possessing of the perspective of factual information, the engineer should exhibit a moral concern and not agree for this design. Sometimes, the guilt is transferred to the government or the competitors.

Some organizations think that they will let the government find the fault or let the fraudulent competitor be caught first. Finally, a full-scale environmental or social impact study of the product or project by individual engineers is useful but not possible, in practice.

Moral Autonomy

Viewing engineering as social experimentation, and anticipating unknown consequences should promote an attitude of questioning about the adequacy of the existing economic and safety standards. This proves a greater sense of personal involvement in one's work.

Accountability

The term Accountability means:

1. The capacity to understand and act on moral reasons
2. Willingness to submit one's actions to moral scrutiny and be responsive to the assessment of others. It includes being answerable for meeting specific obligations, i.e., liable to justify (or give reasonable excuses) the decisions, actions or means, and outcomes (sometimes unexpected), when required by the stakeholders or by law.

The tug-of-war between of causal influence by the employer and moral responsibility of the employee is quite common in professions. In the

engineering practice, the problems are:

(a) The fragmentation of work in a project inevitably makes the final products lie away from the immediate work place, and lessens the personal responsibility of the employee.

(b) Further the responsibilities diffuse into various hierarchies and to various people. Nobody gets the real feel of personal responsibility.

(c) Often projects are executed one after another. An employee is more interested in adherence of tight schedules rather than giving personal care for the current project.

(d) More litigation is to be faced by the engineers (as in the case of medical practitioners).

This makes them wary of showing moral concerns beyond what is prescribed by the institutions. In spite of all these shortcomings, engineers are expected to face the risk and show up personal responsibility as the profession demands.

8. Explain in detail about Engineering as Experimentation(April/May 2018)

Before manufacturing a product or providing a project, we make several assumptions and trials, design and redesign 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

1. Design
2. Fabrication, Assembly,
3. Physical Tests, Simulation
4. Prototype, Pilot Plant,
5. Model Study
6. Final Design
7. Manufacture
8. Field Study

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 feedback 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.

9. How can engineer become a responsible experimenter? Highlight the code of ethics for Engineers. (APRIL/MAY 2017) (April/May 2019)

ENGINEERS AS RESPONSIBLE EXPERIMENTERS

The engineers have so many responsibilities for serving the society.

1. A primary duty is to protect the safety of human beings and respect their right of consent. [A conscientious commitment to live by moral values].
2. Having a clear awareness of the experimental nature of any project, thoughtful forecasting of its possible side effects, and an effort to monitor them reasonably. [A comprehensive perspective or relative information].
3. Unrestricted free personal involvement in all the steps of a project. [Autonomy]
4. Being accountable for the results of a project [Accountability]
5. Exhibiting their technical competence and other characteristics of professionalism.

Conscientiousness

Conscientiousness implies consciousness (sense of awareness). As holding the responsible profession with maintaining full range moral ethics and values which are relevant to the situation. In order to understand the given situation, its implications, know- how, person who is involved or affected, Engineers should have open eyes, open ears and open mind.

Relevant Information

Without relevant factual information, conscientious is not possible. For showing moral concern there should be an obligation to obtain and assess properly all the available Information related to the fulfillment of one's moral obligations.

This can be explained as

1.To understand and grasp the circumstance of a person's work.

2.Blurring the circumstance of a person's work derived from his specialization and division of labour is to put the responsibilities on someone else in the organization.

Moral Autonomy

This refers to the presonal environment involve in one's activities. People are moral autonomous only when their moral conduct and principles of actions are their own i.e.genuine is ones commitment to moral values.

Moral beliefs and attitudes must be integrated leads to a committed action. They cannot be agreed formally and adhered to merely verbally. So, the individual principles are not passively absorbed from others. When he is morally autonomous and also his actions are not separated from himself.

Accountability

The people those who feel their responsibility, always accept moral responsibilities

For their actions. It is known as accountable.In short accountable means culpable and hold responsible for faults. In general and to be proper, it means the general tendency of being willing to consider one's action to moral examination and be open and respond to the assessment of others. It comprises a desire to present morally convincing reasons for one's conduct when called upon in specific circumstances.

10. What is the important code of ethics? Give brief account on '4'canons of codes of ethics quoted by international standard or association. (Nov 2015)

CODES OF ETHICS

The codes of ethics have to be adopted by engineering societies as well as by engineers. These codes exhibit the rights, duties, and obligations of the members of a profession. Codes are the set of laws and standards.

A code of ethics provides a framework for ethical judgment for a professional. A code cannot be said as totally comprehensive and cover all ethical situations that an engineer has to face. It serves only as a starting

point for ethical decision-making. A code expresses the circumstances to ethical conduct shared by the members of a profession. It is also to be noted that ethical codes do not establish the new ethical principles. They repeat only the principles and standards that are already accepted as responsible engineering practice. A code defines the roles and responsibilities of professionals.

Codes give a convinced motivation for ethical conduct and provide a helpful guidance for achieving the obligations of engineers in their work. Codes contribute mostly general guidance as they have to be brief. Specific directions may also be given to apply the code in morally good ways. The following engineering societies have published codes of ethics.

AAES - American Association of Engineering Societies

ABET - Accreditation Board for Engineering and Technology (USA)
NSPE - National Society of Professional Engineer (USA)

IEEE - Institute of Electrical and Electronics Engineering (USA)
AICTE - All India Council for Technical Education (India)

Most of the technological companies have established their own codes such as pentagon (USA), Microsoft etc. These codes are very much helpful to strengthen the moral issues on the work of an engineer.

Code of Ethics for Engineers

Accreditation Board for Engineering and Technology(ABET)

The Fundamental Principles

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

- Using their knowledge and skill for the enhancement of the human race;
- Being honest and impartial and serving with fidelity the public, their employers, and clients;
- Striving to increase the competence and prestige of the engineering profession.
- Supporting the professional and technical societies of their

discipline.

The Fundamental Cannons

Engineers shall hold paramount the safety, health, and welfare of the public in the performance of their professional duties; perform service only in areas of their competence; issue public statements only in an objective and truthful manner; act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest; build their professional reputations on the merits of their services and shall not compete unfairly with others act in such manner as to uphold and enhance the honor, integrity and dignity of the profession; continue their professional development throughout their careers, and shall provide opportunities for superv ision.

11. Discuss on the roles played by the codes of ethics set by professional societies. (Nov 2015)

A code defines the roles and responsibilities of professionals.

Roles of codes and its functions

1. Inspiration and Guidance

Codes give a convinced motivation for ethical conduct and provide a helpful guidance for achieving the obligations of engineers in their work. Codes contribute mostly general guidance as they have to be brief. Specific directions may also be given to apply the code in morally good ways. The following engineering societies have published codes of ethics.

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2. Support

Codes always support an engineer who follows the ethical principles. Codes give engineers a positive, a possible good support for standing on moral issues. Codes also serve as a legal support for engineers.

3. Deterrence and Discipline

Codes act as a deterrent because they never encourage to act immorally. They also provide discipline among the Engineers to act morally on the basis of codes does not overrule the rights of those being investigated.

4. Education and Mutual Understanding

Codes have to be circulated and approved officially by the professionals, the public and government organizations which concern with the moral responsibilities of engineers and organizations.

5. Contributing to the profession's Public Image

Codes help to create a good image to the public of an ethically committed profession. It helps the engineers in an effective manner to serve the public. They also gives self-regulation for the profession itself.

6. Protecting the Status Quo

Codes determine ethical conventions which help to create an agreed upon minimum level of ethical conduct. But they can also suppress the disagreement within the profession.

7. Promoting Business Interests

Codes help to improve the business interests. They help to moralize the business dealings to benefit those within the profession.

UNIT - 4

SAFETY, RESPONSIBILITIES AND RIGHTS

PART A

1. Define risk benefit analysis. (APRIL/MAY 2017/2018) (NOV/DEC 2015)

The major reasons for the analysis of the risk benefit are:

1 To know risks and benefits and weigh them each

2 To decide on designs, advisability of product/project

3 To suggest and modify the design so that the risks are eliminated or reduced

2. What is meant by whistle blowing. (NOV/DEC 2015)

Whistle blowing is defined as conveying information by an employee on an important moral problem to somebody in a position to take action on the problem.

Further this is done outside the approved organizational channels.

3. Define the term risk. (NOV/DEC 2014)

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 – Probability of risk

Risk = Probability of occurrence × Consequence in magnitude.

4. What is the difference between bribe and gift. (NOV/DEC 2014)

The conflict arises when accepting large gifts from the suppliers. Bribe is different from a gift.

Tests Bribe Gift

1. Timing Given before Given after

2. Cost of item Large amount Small amount, articles of daily use

3. Quality of product Poor Good/High

4. Giver is a friend Yes No

5. Transparency Made in secret Made in open

6. Motive Expect undue favor Expect a favor or thanking for the favor

7. Consequence on Damaging the goodwill No damage is involved organization's and reputation goodwill

5. Define collegiality. (APRIL/MAY 2015)

Collegiality is the tendency to support and cooperate with the colleagues. It is a virtue essential for the team work to be effective.

Aspects

1. Respect to the ideas and work of others.
2. Commmitment to moral principles.
3. Connectedness.

6. What is agency loyalty. (JUNE 2014)

It is an obligation to fulfill his/her contractual duties to the employer. The duties are specific actions one is assigned and in general cooperating with others in the organization.

It consists of several obligations to employers. But for the engineers the paramount obligation is still the safety health and welfare of the public.

7. What is the prirme objectives of intellectual property right legislation. (JUNE 2014)

It is the information and original expression that derives its original value from creative ideas and is with a commercial value.

IP permits people to have fully independent ownership for their innovations and creativity like that if own physical property.

This encourages the IP owners towards innovation and benefit to the society. It is an asset that can be bought or sold, licensed, and exchanged. It is intangible i.e., it cannot be identified by specific parameters.

8. Mention the different types of intellectual property rights.(NOV/DEC 2013)

1. Patents
2. Copyright

3. Trademark

9. What is FMEA.

FMEA is defined as a systematic tool to

(a) identify possible failure modes in the products/process,

(b) to understand failure mechanism (process that leads to failure),

(c) risk analysis, and

(d) plan for action on elimination or reduction of failure modes.

10. Define collective bargaining. (APRIL/MAY 2017)

It is the bargain by the trade union for improving the economic interests of the worker members. The process includes negotiation, threatening verbally, and declaration of 'strike'. It is impossible to endorse fully the collective bargaining of unions or to condemn. There exist always conflicting views between the professionalism and unionism.

11. Define confidentiality.(April/May 2018)

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

12. Define Fault-tree Analysis

This is a qualitative method and was originated by Bell Telephones. It is technology-based deductive logic. The failure (undesirable event) is initially defined, and the events (causal relationships) leading to that failure are identified at different components level. This method can combine hardware failures and human failures.

13. What are all the conditions referred to as 'safe exit'.

1 The product, when it fails, should fail safely

2 The product, when it fails, can be abandoned safely (it does not harm others by explosion or radiation)

3 The user can safely escape the product (e.g., ships need sufficient number of life boats for all passengers and crew; multi-storeyed buildings need usable fire escapes)

14. Define 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.

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.

15. What are all the Safety Lessons From TMI and Chernobyl

1. The thickness of the containment should be more, to withstand the possible explosion and further damage due to radiation and leakage over the surroundings (Chernobyl).

2. When the test began at low loads, the demand for increased out-power should have been declined.

16. Define authority.

Decisions can be taken by a few people, but putting into action requires larger participation from different groups of people, such as operation, purchase, sales, accounts, maintenance, finance etc. In effectively-and efficiently-transferring decisions to actions, the authority comes into play a great role.

Otherwise the individual discretions may ruin the activities. Further the authority fixes the personal responsibility and accountability uniquely on each person. This is necessary to ensure progress in action.

17. Institutional Authority

It is the authority exercised within the organization. It is the right given to the employees to exercise power, to complete the task and force them to achieve their goals. Duties such as resource allocation, policy dissemination, recommendation, supervision, issue orders (empower) or directions on subordinates are vested to institutional authority, e.g.,

Line Managers and Project Managers have the institutional duty to make sure that the products/projects are completed successfully. The characteristics features of institutional authority are that they allocate money and other resources and have liberty in execution.

18. Define Moonlighting

It is a situation when a person is working as employee for two different companies in the spare time. This is against the right to pursue 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. Another effect of moonlighting is that it leaves the person exhausted and harms the job performance in both places.

19. Define occupational crime.

An occupational crime may be committed by (1) wrong actions of a person through one's lawful employment or (2) crime by an employee to promote ones own or employer's interest or (3) theft .

20. Define human rights.

Human rights are defined as moral entitlements that place obligations on other people to treat one with dignity and respect. Organisations and engineers are to be familiar with the minimum provisions under the human rights, so that the engineers and organizations for a firm base for understanding and productivity. Provisions under 'human rights' are as follows:

1. Right to pursue legitimate personal interest
2. Right to make a living
3. Right to privacy
4. Right to property
5. Right of non-discrimination

21. Define Discrimination.

Discrimination which means a morally unjust treatment of people in the workplace is damaging to the human dignity.

For example,

(a) A senior manager post is vacant. There is competent and proven candidate from outside the state. A local engineer with lesser competence is promoted.

(b) Prize amounts for the winners in the world sport events are not the same for men and women.

22. What are all the classification of whistle blowing.

Based on the destination (recipient), whistle blowing is classified into types, as:

(a) Internal: In this case, the information is conveyed to a person within the organization, but beyond the approved channels.

(b) External: This happens when the information is transmitted outside the organization. The recipient may be a municipal chairman or member of legislature or minister. It becomes severe if the information reaches the press and through them the public. The damage is maximum and sometimes poses difficulty in remedying the situation.

Based on the origin or source (agent), this can be divided into three types, as follows:

(a) Open: The originator reveals his identity as he conveys the information. This information is reliable and true, but sometimes partially true.

(b) Anonymous: The identity is concealed. The information may or may not be true. But the agent anticipates perhaps some repression or threat, if identity is revealed.

(c) Partly anonymous (or partly open): Such a situation exists when the individual reveals his identity to the journalist, but insists that the name be withheld from others.

23. What are all the need for Protection of IP

IP plays an essential role to stabilize and develop the economy of a nation. This protection actually stimulates creativity, research, and innovation by ensuring freedom to individuals and organizations to benefit from their creative intellectual investments. The IP serves many purposes, namely

(a) it prevents others using it,

(b) prevent using it for financial gain,

(c) prevent plagiarism

(d) fulfill obligation to funding agency. ICICI Bank has advanced loan against IP as security to

Shopper's Stoppe, New Delhi, and

(e) provides a strategy to generate steady income.

Some of the challenges in the acquisition of IP are:

(a)Shortage of manpower in the industry. Educational institutions can play a vital role in providing the same.

(b) High cost of patenting and lengthy procedure. This was being considered by the Government and a simpler and faster procedure is expected, and

(c)Lack of strong enforcement mechanism.

24. Define Patents

Patent is a contract between the individual (inventor) and the society (all others). Patents protect legally the specific products from being manufactured or sold by others, without permission of the patent holder. Patent holder has the legally-protected monopoly power as one's own property. The validity is 20 years from the date filing the application for the patent. It is a territorial right and needs registration. The Patent (Amendment) Act 2002 guarantees such provisions.

Patent is given to a product or a process, provided it is entirely new, involving an inventive method and suitable for industrial application. While applying for a patent, it is essential to submit the documents in detail regarding the problem addressed, its solution, extent of novelty or innovation, typical applications, particulars of the inventor, and the resources utilized. Inventions are patentable and the discoveries are not.

25. Define Copyright

The copyright is a specific and exclusive right, describing rights given to creators for their literary and artistic works. This protects literary

material, aesthetic material, music, film, sound recording, broadcasting, software, multimedia, paintings, sculptures, and drawings including maps, diagrams,

engravings or photographs. There is no need for registration and no need to seek lawyer's help for settlement. The life of the copyright protection is the life of the inventor or author plus 50 years.

Copyright gives protection to particular expression and not for the idea. Copyright is effective in (*a*) preventing others from copying or reproducing or storing the work, (*b*) publishing and selling the copies, (*c*) performing the work in public, commercially (*d*) to make film (*e*) to make translation of the work, and (*f*) to make any adaptation of the work. Copying the idea is called 'plagiarism' and it is dealt with separately.

26. Define Trademark

Trademark is a wide identity of specific good and services, permitting differences to be made among different trades. It is a territorial right, which needs registration. Registration is valid initially for 10 years, and renewable. The trademark or service mark may be registered in the form of a device, a heading, a label, a ticket, a letter, a word or words, a numeral or any combination of these, logos, designs, sounds, and symbols. Trademark should not be mistaken for a design, e.g., the shape of a bottle in which a product is marketed, can not be registered as a trademark.

27. What are all the function of trademark.

There are three functions of trademark:

1. Just as we are identified by our names, good are identified by their trademarks. For example, the customer goes to the shop and asks for Lux soap. The word 'Lux' is a trade mark. In other words it shows the origin or source of the goods.
2. The trademark carries with it an inherent indication or impression on the quality of goods, which indirectly demonstrates that it receives the customer's satisfaction.
3. The trademark serves as silent sales promoter. Without a trademark, there can be no advertisement. In other words, it serves as a medium for advertising the goods.

28. What are all the Aspects of whistle blowing

There are four aspects of whistle blowing, namely:

1. *Basis of disclosure*: The basis for disclosure may be intentional, or under pressure from superiors or others not to disclose.
2. *Relevance of topic*: The whistle blower believes that the information is about a significant problem for the organization or its business ally. It can be a threat to the public or employees' health, safety and welfare or a criminal activity, or unethical policies or practices, or an injustice to the workers within the organization.
3. *Agent*: The person disclosing the information may be a current or former employee or a person having a close link to the organization.
4. *Recipient*: The person or organization, who receives the information, is in a position to remedy the problem or alert the affected parties. Usually, the recipients are not aware of the information fully or even partially.

29. Define Expert Authority

The Expert Authority is (a) the possession of special knowledge, skills and competence to perform a job thoroughly (expertise), (b) the advice on jobs, and (c) is a staff function. It is also known as 'authority of leadership'. These experts direct others in effective manner, e.g., advisers, experts, and consultants are engaged in an organization for a specific term.

30. What are all the safety lessons learn from challenger case study.

The safety lessons one can learn in the Challenger case are as follows:

1. Negligence in design efforts. The booster rocket casing recovered from earlier flights indicated the failure of filed-joint seals. No deign changes were incorporated. Instead of two O-rings, three rings should have been fixed. But there was no time for testing with three rings. At least three rings could have been tried while launching.
2. Tests on O-rings should have been conducted down to the expected ambient temperature i.e., to 20 oF. No normalization of deviances should have been allowed.

3. NASA was not willing to wait for the weather to improve. The weather was not favorable on the day of launch. A strong wind shear might have caused the rupture of the weakened Orings.

4. The final decision making of launch or no-launch should have been with the engineers and not on the managers. Engineers insisted on 'safety' but the managers went ahead with the 'schedule'.

PART B

1. Discuss the concept of safe exit in the Chernobyl case study. (NOV/DEC 2015)

The RBMK (Acronym for water cooled and graphite moderated) reactors were graphite moderated and they use water tubes. A test on the turbine generator was planned to be conducted during a scheduled plant shut-down maintenance.

To conduct the test, the power plant output was reduced to 700 MW. But due to a sudden and unexpected demand, the power output has to be raised.

1. To go ahead with the test, the reactor operators had already disconnected the emergency core-cooling system, ignoring the raise in demand situation.
2. Further, a control device was not properly reprogrammed to maintain power at 700-100 MW level
3. The test was conducted at 200 MW power out-put which is very low for the test. They should have shut down the reactor.
4. The operators blocked all emergency signals and automatic shut-down controls, thus all safety systems were disconnected.
5. The operators raised control rods to increase power output and tried to continue the test. This made the reactor unsafe. The temperature of RBMK reactor increased and the fission rate increased.
6. The test should have been postponed but continued. The reactor core melted and due to the Hydrogen accumulation, the reactor caught fire and the radioactive waste began to spread out in USSR and also Europe.

The people living around were informed after a few hours and were evacuated 12 hours after the explosion. More than 30 workers in the

complex lost their lives, while 200 workers sustained burns.

About 8000 people lost their lives. The agricultural products were affected due to contaminated

radioactive water, for several years.

2. What is intellectual property rights(IPR).Explain any one essential element of IPR. (APRIL/MAY 2017) (April/May 2019) (NOV/DEC 2015)

It is the information and original expression that derives its original value from creative ideas and is with a commercial value.

IP permits people to have fully independent ownership for their innovations and creativity like that if own physical property.

This encourages the IP owners towards innovation and benefit to the society. It is an asset that can be bought or sold, licensed, and exchanged. It is intangible i.e., it cannot be identified by specific parameters.

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3. Discuss the human rights and professional rights in engineering field.(NOV/DEC 2015)

Human rights are defined as moral entitlements that place obligations on other people to treat one with dignity and respect. Organisations and engineers are to be familiar with the minimum provisions under the human rights, so that the engineers and organizations for a firm base for understanding and productivity. Provisions under 'human rights' are as follows:

1. Right to pursue legitimate personal interest
2. Right to make a living
3. Right to privacy
4. Right to property
5. Right of non-discrimination
6. No sexual harassment

Under professional rights, the following provisions are protected:

1. Right to form and express professional judgment: It is also called the right of professional conscience. In pursuing professional responsibilities, this empowers one to form and exercise the professional judgment. Both technical and moral judgments are included. This right is bound by the responsibilities to employers and colleagues.

2. Right to refuse to participate in unethical activities: It is also called the right of conscientious refusal. It is the right to refuse to engage in unethical actions and to refuse to do so solely because one views that as unethical. The employer can not force or threaten the employee to do something that is considered by that employee as unethical or unacceptable. For example, unethical and illegal activities that can be refused are: falsifying data, forging documents, altering test results, lying, giving or taking bribe etc. There may be situations, when there is a disagreement or no shared agreement among reasonable people over whether an act is unethical. Medical practitioners have a right not to participate in abortions. Similarly, the engineers must have a right to refuse assignments that violate their personal conscience, such as when there exists a threat to human life or moral disagreement among reasonable people.
3. Right to fair recognition and to receive remuneration for professional services: Engineers have a right to professional recognition for their work and achievements. This includes fair monetary and non-monetary forms of recognition. It is related to morality as well as selfinterest.

They motivate them to concentrate their energy on jobs and to update their knowledge and skills through continuing education. This will prevent the engineers from diversion such as moonlighting or bother on money matters. Many times, the engineers who have labored to get patents on the organizations are not adequately remunerated. Based on the resources of the organization and the bargaining power of the engineers, the reasonable salary or remuneration for patent discovery can be worked out.

4. **Explain in detail about collegiality and loyalty. (NOV/DEC 2014)**

Collegiality is the tendency to support and cooperate with the colleagues. It is a virtue essential for the team work to be effective.

Aspects

1. Respect to the ideas and work of others.
2. Commmitment to moral principles.
3. Connectedness

Loyalty

It is exhibited in two ways.

1. Agency loyalty

It is an obligation to fulfill his/her contractual duties to the employer. The duties are specific actions one is assigned and in general cooperating with others in the organization.

It consists of several obligations to employers. 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. The attitude loyalty is more a virtue than an obligation. This type of loyalty is all right when the organizations work for productivity or development of community. Working together in falsification of records or serious harm to the public, does not merit loyalty. Further, with frequent takeovers or merger resulting in large-scale layoff, employees find it difficult to maintain attitude-loyalty.

5. Write a brief notes on institutional authority. (MAY/JUNE 2015)

It is the authority exercised within the organization. It is the right given to the employees to exercise power, to complete the task and force them to achieve their goals. Duties such as resource allocation, policy dissemination, recommendation, supervision, issue orders (empower) or directions on subordinates are vested to institutional authority, e.g., Line Managers and Project Managers have the institutional duty to make sure that the products/projects are completed successfully. The characteristics features of institutional authority are that they allocate money and other resources and have liberty in execution.

6. Explain the concept of safety. (APRIL 2014)

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 – Probability of risk

Risk = Probability of occurrence × 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 on a proportional scale model with all vital components fixed in 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.

7. Define risk benefit analysis? Why is it conducted? What are the limitation of risk benefit analysis. (APRIL/MAY 2017/2018) (NOV/DEC 2013)

The major reasons for the analysis of the risk benefit are:

1 To know risks and benefits and weigh them each

2 To decide on designs, advisability of product/project

3 To suggest and modify the design so that the risks are eliminated or reduced

There are some limitations that exist in the risk-benefit analysis. The economic and ethical limitations are presented as follows:

1. Primarily the benefits may go to one group and risks may go to another group. Is it ethically correct?

2. Is an individual or government empowered to impose a risk on some one else on behalf of supposed benefit to some body else? Sometimes, people who are exposed to maximum risks may get only the minimum benefits. In such cases, there is even violation of rights.

3. The units for comparison are not the same, e.g., commissioning the express highways may add a few highway deaths versus faster and comfortable travel for several commuters. The benefits may be in terms of fuel, money and time saved, but lives of human being sacrificed. How do we then compare properly?

4. Both risks and benefits lie in the future. The quantitative estimation of the future benefits, using the discounted present value (which may fluctuate), may not be correct and sometime misleading.

5. Both risk and benefits have uncertainties.

8. Write short notes on Occupational crime. (Nov 2015)

Occupational Crime

- Occupational crimes are illegal acts made possible through one's lawful employment.
- It is the secretive violation of laws regulating work activities.
- When committed by office workers or professionals, occupational crime is called "white collar crime".

People Committing Occupational Crimes

- Usually have high standard of education
- From a non-criminal family background
- Middle class male around 27 years of age (70% of the time) with no previous history
- No involvement in drug or alcohol abuse
- Those who had troublesome life experience in the childhood (Blum)
- People without firm principles (Spencer)
- Firms with declining profitability (Coleman, 1994)
- Firms in highly regulated areas and volatile market - pharmaceutical, petroleum industry.(Albanese, 1995)

Price Fixing

An act was passed, which forbade (prevented) companies from jointly setting prices in ways that restrain free competition and trade. Unfortunately, many senior people, well respected and positioned were of the opinion that „price fixing" was good for their organizations and the public.

9. Discuss the features, guideline and procedures of whistle blowing?

Whistle-blowing and Its Features

Whistle blowing is an act of conveying information about a significant moral problem by a present or former employee, outside approved channels (or against strong pressure) to someone, in a position to take action on the

problem.

The features of *Whistle blowing* are:

- Act of Disclosure: Intentionally conveying information outside approved organizational channels when the person is under pressure not to do so from higher-ups.
- Topic: The information is believed to concern a significant moral problem for the organization.
- Agent: The person disclosing the information is an employee or former employee.
- Recipient: The information is conveyed to a person or organization who can act on it.

Types of Whistle Blowing

External Whistle blowing: The act of passing on information outside the organisation.

Internal Whistle blowing: The act of passing on information to someone within the organization but outside the approved channels.Either type is likely to be considered as disloyalty, but the second one is often seen as less serious than the latter. From corporations" point of view both are serious because it leads to distrust, disharmony, and inability of the employees to work together.

Open Whistle blowing: Individuals openly revealing their identity as they convey the information.

Anonymous Whistle blowing: Individual conveying the information conceals his/her identity.

Procedures to be followed before Whistle Blowing

- Except for extreme emergencies, always try working through normal organizational channels.
- Be prompt in expressing objections.
- Proceed in a tactful manner with due consideration to the feelings of others involved.
- As much as possible, keep supervisors informed of your actions, both informally and formally.
- Be accurate in observations and claims and keep all formal

and documenting relevant events.

- Consult colleagues for advice and also to avoid isolation.
- Consult the ethics committee of your professional society before going outside the organization.
- Consult a lawyer regarding potential legal liabilities.

A great deal of introspection and reflection are required before WB. Motive should neither be for revenge upon fellow employee, supervisor or company nor in the hope of future gains like book contracts or speaking tours etc.

Conditions to be satisfied before Whistle Blowing

Richard T. De George suggests the following:

1. The harm that will be done by the product to the public is serious and considerable.
2. The individual makes his/her concern known to his/her superiors.
3. If one does not get any proper response from immediate superiors, then one should exhaust the channels that are available within the organization including the board of directors.
4. One must have documented evidence that would convince a reasonable and impartial observer that one"s view of the situation is correct and the company policy is wrong.
5. There must be strong evidence that making the information public will in fact prevent the threatened serious harm.

Prevention of Whistle Blowing

The following *actions* will *prevent/reduce* whistle blowing:

1. Giving *direct access* to higher levels of management by announcing „*open door"* policies with guarantee that *there won"t be retaliation.* Instead such employees should be *rewarded for fostering ethical behavior* in the company.
2. This gives greater freedom and promotes 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 top management*.

5. Engineers should be *allowed to discuss in confidence*, their moral concerns with the ethics committee of their professional societies.

6. When there are differences on ethical issues between engineers and management, *ethics committee members* of the professional societies *should be allowed* to enter into these discussions.

7. *Changes and updations* in law must be explored by engineers, organizations, professional societies and government organizations on a continuous basis.

10. Discuss Event Tree analysis with some practical example of risk analysis.(April/May2018)

Fault Tree Analysis (FTA) :

A system failure is proposed and then events are traced back to possible causes at the component level. The reverse of the fault-tree analysis is **„event – tree analysis".**

This method most effectively illustrates the disciplined approach required to capture as much as possible of everything that affects proper functioning and safety of a complex system.

Risk Analysis

Ethical Implications

- When is someone entitled to impose a risk on another in view of a supposed benefit to others?
- Consider the worst case scenarios of persons exposed to maximum risks while they are reaping only minimum benefits. Are their rights violated?
- Are they provided safer alternatives?
- Engineers should keep in mind that risks to known persons are perceived differently from statistical risks
- Engineers may have no control over grievance redressal.

11. Explain the concept of Confidentiality in detail.

'Confidentiality or confidential information'

- Information considered desirable to be kept secret.
- Any information that the employer or client would like to have kept secret in order to compete effectively against business rivals.
- This information includes how business is run, its products, and suppliers, which directly affects the ability of the company to compete in the market place
- Helps the competitor to gain advantage or catch up

Privileged information, Proprietary information and Patents.

Privileged information:

"Information available only on the basis of special privilege" such as granted to an employee working on a special assignment.

Proprietary information:

Information that a company owns or is the proprietor of.

This is primarily used in legal sense.

Also called Trade Secret. A trade secret can be virtually any type of information that has not become public and which an employer has taken steps to keep secret.

Patents:

- Differ from trade secrets.
- Legally protect specific products from being manufactured and sold by competitors without the express permission of the patent holder.
- They have the drawback of being public and competitors may already work around them by creating alternate designs.

Obligation of Confidentiality

1. Based on ordinary moral considerations:

i. Respect for autonomy:

- *Recognizing the legitimate control* over private information (individuals or corporations).
- This control is required *to maintain their privacy* and protect

their self interest.

ii. Respect for Promise:

- Respecting promises in terms of employment contracts not to divulge certain information considered sensitive by the employer

iii. Regard for public well being:

- Only when there is a *confidence* that the physician *will not reveal* information, the patient will have the *trust to confide* in him.
- Similarly only when companies maintain some degree of confidentiality concerning their products, the benefits of competitiveness within a free market are promoted.

2. Based on Major Ethical Theories:

- All theories profess that employers have moral and institutional rights to decide what information about their organization should be released publicly.
- They acquire these rights as part of their responsibility to protect the interest of the organization.
- All the theories, rights ethics, duty ethics and utilitarianism justify this confidentiality but in different ways.

Effect of Change of Job on Confidentiality

- Employees are obliged to protect confidential information regarding former employment, after a change of job.
- The confidentiality trust between employer and employee continues beyond the period of employment.
- But, the employee cannot be forced not to seek a change of job.
- The employer"s right to keep the trade secrets confidential by a former employee should be accepted at the same time, the employee"s right to seek career advancement cannot also be denied.

12. What are the types of conflicts of interests and the different ways to avoid conflicts of interests?

Conflict of Interest

Conflict of Interest arises when two conditions are met:

1. The professional is in a relationship or a role that requires exercising good judgment on behalf of the interests of an employer or client and

2. The professional has some additional or side interest that could threaten good judgment in serving the interests of the employee or client. E.g. When an engineer is paid based on a percentage of the cost of the design and there is no incentive for him to cut costs- The distrust caused by this situation compromises the engineers‟ ability to cut costs and calls into question his judgement.

"An act of gift" and "An act of bribe" "A gift is a bribe if you can't eat, drink or smoke it in a day".

"If you think that your offer of acceptance of a particular gift would have grave or merely embarrassing consequences for your company if made public, then the gift should be considered a bribe".

"Bribe can be said to be a substantial amount of money or goods offered beyond a stated business contract with the aim of winning an advantage in gaining or keepingthe contract". Here "substantial" means that which is sufficient to distort the judgment of a typical person.

Conflict of Interest created by Interest in other companies

- When one works actually for the competitor or subcontractor as an employee or consultant.
- Having partial ownership or substantial stock holdings in the competitor's business.
- It may not arise by merely having a spouse working for a subcontractor to one‟s company, but it will arise if one's job also includes granting contracts to that subcontractor.
- Tempting customers away from their current employer, while still working for them to form their own competing business.
- Moonlighting usually creates conflicts when working for competitors, suppliers or customers but does not conflict when working for others without affecting the present employer's business.

"Moonlighting" means working in one's spare time for another employer.

Conflicts of Interest created by Insider information

- Using inside information to set-up a business opportunity for oneself or family or friends.
- Buying stock in the company for which one works is not objectionable but it should be based on the same information available to the public.
- The use of any company secrets by employee to secure a personal gain threatens the interest of the company.

Avoiding Conflicts Of Interests

- Taking guidance from Company Policy
- In the absence of such a policy taking a second opinion from a coworker or manager. This gives an impression that there no intension on the part of the engineer to hide anything.
- In the absence of either of these options, to examine ones own motives and use the ethical problem solving techniques.
- One can look carefully into the professional codes of ethics which uniformly forbid conflicts of interest. Some of these codes have very explicit statements that can help determine whether or not the situation constitutes conflict of interest.

13. Distinguish between employee rights and professional rights.

(April/May 2019) (April/May 2017)Employee Rights

Employee rights are any rights, moral or legal, that involve the status of being an employee.

Employee rights are:

There should be *no discrimination* against an employee *for criticizing* ethical, moral or legal policies and practices of the organization.

- The organization will not also discriminate against an employee for engaging in outside activities or for objecting to an organization directive that violates common norms of morality.
- The employee will not be deprived of any enjoyment of reasonable privacy in his/her workplace.

- No personal information about employees will be collected or kept other than what is necessary to manage the organization efficiently and to meet the legal requirements.
- No employee who alleges that her/his rights have been violated will be discharged or penalized without a fair hearing by the employer organization. Some clear examples: falsifying data, avoidance on the safety of a product.

Professional rights:

- The right to form and express one's professional judgment freely
- The right to refuse to carry out illegal and unethical activity
- The right to talk publicly about one's work within bounds set by confidentiality obligation
- The right to engage in the activities of professional societies
- The right to protect the clients and the public from the dangers that might arise from one's work
- The right to professional recognition of one's services.

Right of Professional Conscience

There is one basic and generic professional right of engineers, the moral right to exercise responsible professional judgment in pursuing professional responsibilities.

Pursuing these responsibilities involves exercising both technical judgment and reasoned moral convictions.

This basic right can be referred to as the right of professional conscience.

Right of Conscientious Refusal

The right of Conscientious refusal is the right to refuse to engage in unethical behaviour and to refuse to do so solely because one views it as unethical.

Two situations to be considered.

1. Where there is widely shared agreement in profession as to whether an act is Unethical

Here, professionals have a moral right to refuse to participate in such

activities.

2. Where there is room for disagreement among reasonable people over whether an act is unethical.

Here, it is possible that there could be different ethical view points from the professional and the employer.In such cases the engineers can have a limited right to turn down assignments that violates their personal conscience only in matters of great importance such as threats to human life.This right also depends on the ability of the employer to reassign the engineer to alternate projects without serious economic hardships to the orgn. The right of professional conscience does not extend to the right to be paid for not working.

Right to Recognition

Right to Recognition involves two parts.

The right to reasonable remuneration gives the moral right for fighting against corporations making good profits while engineers are being paid poorly. Also is the case where patents are not being rewarded properly by the corporations benefiting from such patents.

The other right to recognition is non-monetary part of recognition to the work of engineers.But what is reasonable remuneration or reasonable recognition is a difficult question and should be resolved by discussions between employees and employers only.

UNIT - 5

GLOBAL ISSUES

PART A

1. What is meant by moral leadership? (NOV/DEC 2015)

Engineers provide many types of leadership in the development and implementation of technology, as managers, entrepreneurs, consultants, academics and officials of the government. Moral leadership is not merely the dominance by a group. It means adopting reasonable means to motivate the groups to achieve morally desirable goals. This leadership presents the engineers with many challenges to their moral principles.

2. What is technology transfer. (NOV/DEC 2015)

It is a process of moving technology to a new setting and implementing it there. Technology includes hardware (machines and installations) and the techniques (technical, organizational, and managerial skills and procedures). It may mean moving the technology applications from laboratory to the field/factory or from one country to another. This transfer is effected by governments, organizations, universities, and MNCs.

3. What do you mean by global issue.

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.

4. What are all the international rights.

International rights

1. Right of freedom of physical movement of people
2. Right of ownership of properties

3. Freedom from torture

4. Right to fair trial on the products

5. Freedom from discrimination on the basis of race or sex. If such discrimination against women or minorities is prevalent in the host country, the MNC will be compelled to accept. MNCs may opt to quit that country if the human rights violations are severe.

5. What is environmental ethics.

Environmental ethics is the study of (a) moral issues concerning the environment, and (b) moral perspectives, beliefs, or attitudes concerning those issues.

6. Define computer ethics.

Computer ethics is defined as (a) study and analysis of nature and social impact of computer technology, (b) formulation and justification of policies, for ethical use of computers. This subject has become relevant to the professionals such as designers of computers, programmers, system analysts, system managers, and operators. The use of computers have raised a host of moral concerns such as free speech, privacy, intellectual property right, and physical as well as mental harm. There appears to be no conceptual framework available on ethics, to study and understand and resolve the problems incomputer technology.

7. What are all the characteristics of engineer as a manager.

1. Promote an ethical climate, through framing organization policies, responsibilities and by personal attitudes and obligations.

2. Resolving conflicts, by evolving priority, developing mutual understanding, generating various alternative solutions to problems.

3. Social responsibility to stakeholders, customers and employers. They act to develop wealthas well as the welfare of the society.

8. Define multinational corporation.(April/May 2017)

Organisations who have established business in more than one country, are called multinational corporation. The headquarters are in the home country and the business is extended in many host countries. The Western organizations doing business in the less-economically developed (developing, and overpopulated) countries gain the advantage

of inexpensive labor, availability of natural resources, conducive-tax atmosphere, and virgin market for the products. At the same time, the developing countries are also benefited by fresh job opportunities, jobs with higher remuneration and challenges, transfer of technology, and several social benefits by the wealth developed. But this happens invariably with some social and cultural disturbance. Loss of jobs for the home country, and loss or exploitation of natural resources, political instability for the *host* countries are some of the threats of globalization.

9. Define Appropriate Technology

Identification, transfer, and implementation of most suitable technology for a set of new situations, is called appropriate technology. Technology includes both hardware (machines and installations) and software (technical, organizational and managerial skills and procedures). Factors such as economic, social, and engineering constraints are the causes for the modification of technology. Depending on the availability of resources, physical conditions (such as temperature, humidity, salinity, geographical location, isolated land area, and availability of water), capital opportunity costs, and the human value system (social acceptability) which includes their traditions, beliefs, and religion, the appropriateness is to be determined.

10. How Appropriate is Aptech?

1. A case against the technology transfer is that the impact of borrowed or transferred technology has been threatening the environment beyond its capacity and sustainable development of the host countries. Large plantations that orient their efforts to exports leave the small farmers out of jobs and at the mercy of the foreign country. For example, genetically modified cotton have shown sufficient disturbance in Europe and Africa. This has made the European Union to oppose the entry of G.M. cotton into Europe.
2. The high technology has contributed to large-scale migration from villages to the cities where corporations are located, leading to the undesirable side-effects of overcrowding of cities, such as the scarcity of water, insanitation, poverty, and the increase in crimes.
3. The term 'appropriate' should emphasize the social acceptability and environmental protection of the host countries, and this need

to be addressed while transferring technology. Thus, we confirm the view that engineering is a continual social experimentation with nature.

11. Define Plastic Waste Disposal

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

12. Define e-Waste Disposal

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

Even the radioactive waste will lose 89% of its toxicity after 200 years, by which time it will be no more toxic than some natural minerals in the ground. It will lose 99% of its remaining toxicity over the next 30,000 years. The toxic chemical agents such as mercury, arsenic, and cadmium retain toxicity undiminished for ever.

13. Different types of problems in computer ethics.

1. Computer as the Instrument of Unethical Acts
2. Computer as the Object of Unethical Act
3. Problems Related to the Autonomous Nature of Computer

14. Why the Engineers involve in weapons development.

1. It gives one job with high salary.
2. One takes pride and honor in participating in the activities towards the defense of the nation (patriotic fervor).

3. One believes the he fights a war on terrorism and thereby contribute to peace and stability of the country. Ironically, the wars have never won peace, only peace can win peace!

4. By research and development, the engineer is reducing or eliminating the risk from enemy weapons, and saving one's country from disaster.

5. By building-up arsenals and show of force, a country can force the rogue country, towards regulation. Engineers can participate effectively in arms control negotiations for surrender or peace, e.g., bombing of Nagasaki and Hiroshima led to surrender by the Japanese in 1945.

15. Characteristics of manager.

The characteristics of engineers as managers are:

1. Promote an ethical climate, through framing organization policies, responsibilities and by personal attitudes and obligations.

2. Resolving conflicts, by evolving priority, developing mutual understanding, generating various alternative solutions to problems.

3. Social responsibility to stakeholders, customers and employers. They act to develop wealth as well as the welfare of the society. Ethicists project the view that the manager's responsibility is only to increase the profit of the organization, and only the engineers have the responsibility to protect the safety, health, and welfare of the public. But managers have the ethical responsibility to produce safe and good products (or useful service), while showing respect for the human beings who include the employees, customers and the public. Hence, the objective for the managers and engineers is to produce valuable products that are also profitable.

16. Define Competitive Bidding

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

17. Define Hired Guns

Mostly lawyers hire engineers to serve the interest of their clients. Lawyers are permitted and required to project the case in a way favorable to their clients. But the engineers have obligations to thoroughly examine the events and demonstrate their professional integrity to testify only the truth in the court.

They do not serve the clients of the lawyers directly. The hired guns forward white lies and distortions, as demanded by the lawyers. They even withhold the information or shade the fact, to favor their clients.

18. Function of expert witness.

1. Gives expert view on the facts in their area of their expertise
2. Interprets the facts, in term of the cause and effect relationship
3. Comments on the view of the opposite side
4. Reports on the professional standards, especially on the precautions when the product is made or the service is provided

19. What are all the requirements for engineers who act as advisors.

1. Objectivity
2. Study All Aspects
3. Values
4. Technical Complexity
5. National Security

20. Why moral leadership is essential for engineers.

Moral leadership is essentially required for the engineers, for the reasons listed as follows:

1. It is leading a group of people towards the achievement of global and objectives. The goals as well as the means are to be moral. For example, Hitler and Stalin were leaders, but only in an instrumental sense and certainly not on moral sense.
2. The leadership shall direct and motivate the group to move through morally desirable ways.
3. They lead by thinking ahead in time, and morally creative towards new applications, extension and putting values into practice.

'Morally creative' means the identification of the most important values as applicable to the situation, bringing clarity within the groups through proper communication, and putting those values into practice.

21. Define Preamble

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

PART B

1. Discuss the ethical issues related to computer ethics.

(APRIL/MAY 2017) **(NOV/DEC 2015)**

Computer ethics is defined as (*a*) study and analysis of nature and social impact of computer technology, (*b*) formulation and justification of policies, for ethical use of computers. This subject has becomerelevant to the professionals such as designers of computers, programmers, system analysts, system managers, and operators. The use of computers have raised a host of moral concerns such as free speech, privacy, intellectual property right, and physical as well as mental harm. There appears to be no conceptual framework available on ethics, to study and understand and resolve the problems in computer technology.

Types of Issues

Different types of problems are found in computer ethics.

Computer as the Instrument of Unethical Acts

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

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

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

2. Computer as the Object of Unethical Act

The data are accessed and deleted or changed.

(a)**Hacking:** The software is stolen or information is accessed from other computers. This may cause financial loss to the business or violation of privacy rights of the individuals or business. In case of defense information being hacked, this may endanger the security of the nation.

(b) **Spreading virus:** Through mail or otherwise, other computers are accessed and the files are erased or contents changed altogether. 'Trojan horses' are implanted to distort the messages and files beyond recovery. This again causes financial loss or mental torture to the individuals. Some hackers feel that they have justified their right of free information or they do it for fun. However, these acts are certainly unethical.

(c)**Health hazard:** The computers pose threat during their use as well as during disposal.

3. Problems Related to the Autonomous Nature of Computer

(a) *Security risk*: Recently the Tokyo Stock Exchange faced a major embarrassment. A seemingly casual mistake by a junior trader of a large security house led to huge losses including that of reputation. The order through the exchange's trading system was to sell one share for 600,000 *Yen*. Instead the trader keyed in a sale order for 600,000 shares at the rate of one *Yen* each.

Naturally the shares on offer at the ridiculously low price were lapped up. And only a few buyers agreed to reverse the deal! The loss to the securities firm was said to be huge, running into several hundred thousands. More important to note, such an obvious mistake could not be corrected by some of the advanced technology available. For advanced countries like Japan who have imbibed the latest technology, this would be a new kind of learning experience.12

(b) *Loss of human lives*: Risk and loss of human lives lost by computer, in the operational control of military weapons. There is a dangerous instability in automated defense system.

An unexpected error in the software or hardware or a conflict during interfacing between the two, may trigger a serious attack and cause irreparable human loss before the error is traced. The Chinese embassy was bombed by U.S. military in Iraq a few years back, but enquiries revealed that the building was shown in a previous map as the building where insurgents stayed.

(c) In flexible manufacturing systems, the autonomous computer is beneficial in obtaining continuous monitoring and automatic control.

Computers In Workplace

The ethical problems initiated by computers in the workplace are:

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

2. *Health and safety*: The ill-effects due to electromagnetic radiation, especially on women and pregnant employees, mental stress, wrist problem known as *Carpel Tunnel Syndrome*, and backpain due to poor ergonomic seating designs, and eye strain due to poor lighting and flickers in the display and long exposure, have been reported worldwide. Over a period of long exposure, these are expected to affect the health and safety of the people. The computer designers should take care of these aspects and management should monitor the health and safety of the computer personnel.

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

Property Issues

The property issues concerned with the computers are:

1. Computers have been used to extort money through anonymous telephone calls.

2. Computers are used to cheat and steal by current as well as previous employees.
3. Cheating of and stealing from the customers and clients.
4. Violation of contracts on computer sales and services.
5. Conspiracy as a group, especially with the internet, to defraud the gullible, stealing the identity and to forge documents.
6. Violation of property rights: Is the software a property? The software could be either a Program (an algorithm, indicating the steps in solving a problem) or a Source code (the algorithm in a general computer language such as FORTAN, C and COBOL or an Object code (to translate the source code into the machine language). How do we apply the concept of property here? This demands a framework for ethical judgments.

Computer Crime

The ethical features involved in computer crime are:

1. Physical Security

The computers are to be protected against theft, fire, and physical damage. This can be achieved by proper insurance on the assets.

2. Logical security

The aspects related are (*a*) the privacy of the individuals or organizations, (*b*) confidentiality, (*c*) integrity, to ensure that the modification of data or program are done only by the authorized persons, (*d*) uninterrupted service. This is achieved by installing appropriate uninterrupted power supply or back-up provisions, and (*e*) protection against hacking that causes dislocation or distortion. Licensed anti-virus packages and firewalls are used by all computer users to ensure this protection. Passwords and data encryption have been incorporated in the computer software as security measures. But these have also been attacked and bye-passed. But this problem is not been solved completely.

Privacy and Anonymity

The data transmission and accessibility have improved tremendously by using the computers, but the right to privacy has been threatened to a great extent. Some issues concerned with the privacy are listed hereunder:

1. Records of Evidence

Service records or criminal records and the details of people can be stored and accessed to prove the innocence or guilty. Records on psychiatric treatment by medical practitioners or hospital, or records of membership of organizations may sometime embarrass the persons in later years.

2. Hacking

There are computer enthusiasts who willfully or for fun, plant virus or "Trojan horses" that may fill the disc space, falsify information, erase files, and even harm the hardware. They breakdown the functioning of computers and can be treated as violation of property rights. Some hackers opine that the information should be freely available for everybody.

3. Legal Response

In the Indian scene, the Right to Information Act 2005 provides the right to the citizens to secure access to information *under the control of public authorities*, including the departments of the central government, state governments, government bodies, public sector companies and public sector banks, to promote transparency and accountability of public authorities.

Professional Responsibility

The computer professionals should be aware of different conflicts of interests as they transact with other at different levels. The IEEE and Association for Computing Machinery (ACM) have establishedthe codes of ethics to manage such responsibilities.

The Big Net

Almost all the countries are now connected by the internet. But there are no international laws to regulate the issues of freedom of speech, intellectual property rights, privacy rights etc. Another development in this direction is, the universities offering degrees-on-line. Third World is certainly gaining knowledge and education. Even Google.com has announced plans to publish research papers through the World Wide Web. Knowledge is power. Knowledge is internationalised! Will this lead to empowerment of the Third World and promotion of World peace? Only the future can answer this question.

2. Discuss in detail about engineers as consultants. (APRIL/MAY 2017/2018) **(NOV/DEC 2015)** The consulting engineers work in private. There is no salary from the employers. But they charge fees from the sponsor and they have more
freedom to decide on their projects. Still they have no absolute freedom, because they need to earn for their living. The consulting engineers have ethical responsibilities different from the salaried engineers, as follows:

1. Advertising

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

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

(a) By white lies.

(b) Half-truth, e.g., a product has actually been tested as prototype, but it was claimed to have been already introduced in the market. An architect shows the photograph of the completed building with flowering trees around but actually the foundation of the building has been completed and there is no real garden.

(c) Exaggerated claims. The consultant might have played a small role in a well-known project. But they could claim to have played a major role.

(d) Making false suggestions. The reduction in cost might have been achieved along with the reduction in strength, but the strength details are hidden.

(e) Through vague wordings or slogans.

2. Competitive Bidding

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

3. Contingency Fee

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

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

4. Safety and Client's Needs

The greater freedom for the consulting engineers in decision making on safety aspects, and difficulties concerning truthfulness are the matters to be given attention. For example, in design-only projects, the consulting engineers may design something and have no role in the construction. Sometimes, difficulties may crop-up during construction due to non-availability of suitable materials, some shortcuts in construction, and lack of necessary and adequate supervision and inspection. Properly-trained supervision is needed, but may not happen, unless it is provided. Further, the contractor may not understand and/or be willing to modify the original design to serve the clients best.

A few on-site inspections by the consulting engineers will expose the deficiency in execution and save the workers, the public, and the environment that may be exposed to risk upon completion of the project.

The NSPE codes on the advertisement by consultants provide some specific regulations. The following are the activities prohibited in advertisement by consultant:

1. The use of statement containing misrepresentation or omission of a necessary fact.
2. Statement intended or likely to create an unjustified expectation.
3. Statement containing prediction of future (probable) success.
4. Statement intended or likely to attract clients, by the use of slogans or sensational language format.

3. Explain in detail about engineers as expert witness and advisors.
(APRIL/MAY 2017) **(NOV/DEC 2015)**

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

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

1. Hired Guns

Mostly lawyers hire engineers to serve the interest of their clients. Lawyers are permitted and required to project the case in a way favorable to their clients. But the engineers have obligations to thoroughly examine the events and demonstrate their professional integrity to testify only the truth in the court.

They do not serve the clients of the lawyers directly. The hired guns forward white lies and distortions, as demanded by the lawyers. They even withhold the information or shade the fact, to favor their clients.

2. Money Bias

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

3. Ego Bias

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

4. Sympathy Bias

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

Duties

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

Advisors

The engineers are required to give their view on the future such as in planning, policy-making, which involves the technology. For example, should India expand nuclear power options or support traditional energy sources such as fossil fuels or alternative forms like solar and wind energy? In the recent past, this topic has created lot of fireworks, in the national media.

Various issues and requirements for engineers who act as advisors are:

1. Objectivity

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

2. Study All Aspects

They have to study the economic viability (effectiveness), technical feasibility (efficiency), operational feasibility (skills) and social

acceptability, which include environmental and ethical aspects, before formulating the policy.

3. Values

Engineers have to posses the qualities, such as (*a*) honesty, (*b*) competence (skills and expertise), (*c*) diligence (careful and alert) (*d*) loyalty in serving the interests of the clients and maintaining confidentiality, and (*e*) public trust, and respect for the common good, rather than serving only the interests of the clients or the political interests.

4. Technical Complexity

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

5. National Security

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

4. Write briefly on environmental ethics and weapon development.
(April/May 2018)(NOV/DEC 2014)

Environmental Ethics

Environmental ethics is the study of (*a*) moral issues concerning the environment, and (*b*) moral perspectives, beliefs, or attitudes concerning those issues. Engineers in the past are known for their negligence of environment, in their activities. It has become important now that engineers design eco-friendly tools, machines, sustainable products, processes, and projects. These are essential now to (*a*) ensure protection (safety) of environment (*b*) prevent the degradation of environment, and (*c*) slow down the exploitation of the natural resources, so that the future generation can survive.

The American Society of Civil Engineers (ASCE) code of ethics, has specifically requires that "engineers shall hold paramount the safety, health, and welfare of the public and shall strive to comply with the principles of sustainable development in the performance of professional duties" The term *sustainable development* emphasizes on the investment, orientation of technology, development and functioning of organizations to meet the present needs of people and at the same time ensuring the future generations to meet their needs.

Engineers as experimenters have certain duties towards environmental ethics, namely:

1. *Environmental impact assessment*: One major but sure and unintended effect of technology is wastage and the resulting pollution of land, water, air and even space. Study how the industry and technology affects the environment.
2. *Establish standards*: Study and to fix the tolerable and actual pollution levels.
3. *Counter measures*: Study what the protective or eliminating measures are available for immediate implementation
4. *Environmental awareness*: Study on how to educate the people on environmental practices, issues, and possible remedies.

Disasters

1. Plastic Waste Disposal

In our country, several crores of plastic bottles are used as containers for water and oil, and plastic bags are used to pack different materials ranging from vegetables to gold ornaments. Hardly any of these are recycled. They end up in gutters, roadsides, and agricultural fields. In all these destinations, they created havoc.

2. e-Waste Disposal

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

3. Industrial Waste Disposal

There has been a lot of complaints through the media, on (*a*) against the Sterlite Copper Smelting Plant in Thuthukkudi (1997) against its pollution,

and (*b*) when Indian companies imported the discarded French Warship Clemenceau for disposal, the poisonous *asbestos* compounds were expected to pollute the atmosphere besides exposing the labor to a great risk, during the disposal. The government did not act immediately.

4. Depletion of Ozone Layer

The *ozone* layer protects the entire planet from the ill-effects of ultraviolet radiation and is vital for all living organisms in this world. But it is eaten away by the Chloro-fluro-carbons (CFC) such as *Freon* emanating from the refrigerators, air conditioners, and aerosol can spray. This has caused also skin cancer to sun-bathers in the Western countries.

WEAPONS DEVELOPMENT

Military activities including the world wars have stimulated the growth of technology. The growth of Internet amply illustrates this fact. The development of warfare and the involvement of engineers bring out many ethical issues concerned with engineers, such as the issue of integrity in experiments as well as expenditure in defense research and development, issue of personal commitment and conscience, and the issues of social justice and social health.

Engineers involve in weapons development because of the following reasons:

1. It gives one job with high salary.
2. One takes pride and honor in participating in the activities towards the defense of the nation (patriotic fervor).
3. One believes the he fights a war on terrorism and thereby contribute to peace and stability of the country. Ironically, the wars have never won peace, only peace can win peace!
4. By research and development, the engineer is reducing or eliminating the risk from enemy weapons, and saving one's country from disaster.
5. By building-up arsenals and show of force, a country can force the rogue country, towards regulation. Engineers can participate effectively in arms control negotiations for surrender or peace, e.g., bombing of Nagasaki and Hiroshima led to surrender by the Japanese in 1945.

Many engineers had to fight and convince their personal conscience. The scene such as that of a Vietnamese village girl running wild with burns on the body and horror in the face and curse in her mind has moved some engineers away from their jobs.

5. Explain the role of engineers as manager. (NOV/DEC 2014)

Characteristics

The characteristics of engineers as managers are:

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

Managing Conflicts

In solving conflicts, force should not be resorted. In fact, the conflict situations should be tolerated, understood, and resolved by participation by all the concerned. The conflicts in case of project managers arise in the following manners:

(a) Conflicts based on schedules: This happens because of various levels of execution, priority and limitations of each level.

(b) Conflicts arising out of fixing the priority to different projects or departments. This is to be arrived at from the end requirements and it may change from time to time.

(c) Conflict based on the availability of personnel.

(d) Conflict over technical, economic, and time factors such as cost, time, and performance level.

(e) Conflict arising in administration such as authority, responsibility, accountability, and logistics required.

(f) Conflicts of personality, human psychology and ego problems.

(g) Conflict over expenditure and its deviations.

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

1. People

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

2. Interests

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

3. Options

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

4. Evaluation

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

6. Explain the moral obligation of an engineer as per the codes of ethics. (APRIL 2014)

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

   (a) Engineers shall acknowledge their errors and shall not distort or alter the facts.

   (b) Engineers shall advice their clients or employers when they believe a project will not be successful.

   (c) Engineers shall not accept outside employment to the detriment of their regular work or interest. Before accepting any outside engineering employment they will notify their employers.

   (d) Engineers shall not attempt to attract an engineer from another employer by false or misleading pretenses.

   (e) Engineers shall not promote their own interest at the expense of the dignity and integrity of the profession.

2. Engineers shall at all times strive to serve the public interest.

   (a) Engineers shall seek opportunities to participate in civic affairs, career guidance for youths, and work for the advancement of the safety, health, and well-being of their community.

   (b) Engineers shall not complete, sign, or seal plans and/or specifications that are not in conformity with applicable engineering standards. If the client or employer insists on such unprofessional conduct, they shall notify the proper authorities and withdraw from further service on the project.

   (c) Engineers shall endeavour to extend public knowledge and appreciation of engineering and its achievements.

3. Engineers shall avoid all conduct or practice that deceives the public.

   (a) Engineers shall avoid the use of statements containing a material mis-representation of fact or omitting a material fact.

   (b) Consistent with the foregoing, engineers may advertise for recruitment of personnel.

   (c) Consistent with foregoing, engineers may prepare articles for the lay or technical press, but such articles shall not imply credit to the author for work performed by other.

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

   (a) Engineers shall not, without the consent of all interested parties, promote or arrange for new employment or practice in connection with a specific project for which the engineer has gained particular and specialized knowledge.

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

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

   (a) Engineers shall not accept financial or other consideration including free engineering designs, from material or equipment suppliers for specifying their product.

   (b) Engineers shall not accept commission or allowances, directly or indirectly, from contractors or other parties dealing with clients or employers of the engineer in connection with work for which the engineer is responsible.

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

   (a) Engineers shall not request, propose, or accept a commission on a contingent basis under circumstances in which their judgement may be compromised.

   (b) Engineers in salaried positions shall accept part-time engineering work only to the extent consistent with policies of the employer and in accordance with ethical consideration.

   (c) Engineers shall not, without consent, use equipment, supplies, laboratory, or office facilities of an employer to carry on outside private practice.

7. Engineers shall not attempt to injure, maliciously or falsely, directly or indirectly, the professional reputation, prospects, practice, or

employment of other engineers. Engineers who believe others are guilty of unethical or illegal practice shall resent such information to the proper authority for action.

(a) Engineers in private practice shall not review the work of another engineer for the same client, except with the knowledge of such engineer, or unless the connection of such engineer with the work has been terminated.

(b) Engineers in governmental, industrial, or educational employment are entitled to review and evaluate the work of other engineers when so required by their employment duties.

(c) Engineers in sales or industrial employ are entitled to make engineering comparisons or represented products with products of other suppliers.

8. Engineers shall accept personal responsibility for their professional activities, provided, however, the engineers may seek indemnification for services arising out of their practice for other than gross negligence, where the engineer's interests can not otherwise be protected.

(a) Engineers shall conform to state registration laws in the practice of engineering.

(b) Engineers shall not use association with a non-engineer, a corporation, or partnership as a 'cloak' for unethical acts.

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

(a) Engineers shall, whenever possible, name the person or persons who may be individually responsible for designs, inventions, writings, or other accomplishments.

(b) Engineers using designs supplied by a client recognize that the designs remain the property of the client and may not be duplicated by the engineer for others, without the express permission.

(c) Engineers before undertaking work for others in connection with which the engineer may make improvements, plans, designs, inventions, or other records that may justify copyrights or patents, should enter into a positive agreement regarding ownership.

(d) Engineers' designs, data, records, and notes referring exclusively to an employer's work are the employer's property. The employer

should indemnify the engineer for use of the information for any purpose other than the original purpose.

(e) Engineers shall continue their professional development throughout their careers and should keep current in their specialty fields by engaging in professional practice, participating in continuing education course, reading in the technical literature, and attending professional meetings and seminars.

7. Explain in detail about Case Study: Bhopal Gas Tragedy(April/may 2018)

The Union Carbide had 51% and the Indian subsidiary UC India Ltd. had 49% of stock. In 1983, there were 14 plants in India manufacturing chemicals, pesticides, and other hazardous products. The Bhopal plant had a license to make Methyl isocyanate-based pesticides. In November 1984, they had decided to close down the plant. For quite some years before the production rate was going down.

In the history of chemical plants disasters, three other wake-up calls were reported. Flixborough accident in 1974 in U.K. when certain modifications carried out in the plant led to the leakage and explosion of cyclohexane, which killed 28 people. The Piper Alpha offshore oil platform disaster in 1988, near Scotland, killed 167 people and resulted in $ 2 billion losses. The third occurred in Toulouse,

France in 2001, killing 29 people, and injuring thousands. A warehouse holding 300 tonnes of ammonium nitrate fertilizer exploded and damaged 10000 buildings, including schools, a university, and a hospital. But we have not learnt from the past. The cumulative effects of the following factors caused the tragedy in Bhopal on December 3, 1984.

1. Maintenance was neglected and the trained maintenance personnel were reduced as economy measure. Need for quick diagnosis aggravates the situation by causing considerable psychological stress on the plant personnel.
2. Training activities for the supervisory personnel were stopped. This led to inadequate training of the personnel to handle emergencies.
3. Periodical Safety Inspection teams from U.S. which visited previously were also stopped. From the initial U.S. Standards, the safety procedures were reduced to low level Indian standards.

The procedures had been deteriorating at these sites for weeks or months, prior to the accident. There was clear lack of management systems and procedures to ensure safety.

4. Vital spares for equipments and machineries were not available
5. Absence of capital replacement led to the stagnant economy of the plant.
6. The high turnover of the experienced engineers and technicians, who were demoralized by the lack of development.
7. Lack of experienced personnel to operate and control the vital installations.
8. They have not conducted a thorough process hazards analysis that would have exposed the serious hazards which resulted in disaster later.
9. No emergency plan was put in practice, during the shut down and maintenance.
10. Above all, the commitment of top-level management to safety was lacking. They have been paying only lip service to safety of people of the host country.

Technologically, the tragedy was caused by a series of events listed:

1. The safety manual of Union Carbide prescribed that the MIC tanks were to be filled only up to 60% of the capacity. But the tanks were reported to have been filled up to 75%.
2. The safety policy prescribed that an empty tank should be available as a stand-bye in case of emergency. But the emergency tank was also filled with to its full capacity. These facts confirmed that the MNC had not followed and implemented appropriate safety standards of the home country in the host country. Can this be called as an example of 'misappropriate technology'?
3. The storage tanks should be refrigerated to make the chemical less reactive. But here the refrigeration system was shut down as an economy measure. This raised the temperature of the gas stored.
4. The plant was shut down for maintenance two months earlier. The worker who cleaned the pipes and filters connected to the tanks and closed the valves, was not trained properly. He did not insert the

safety disks to prevent any possible leakage of the gas. This led to the build up of temperature and pressure in the storage tanks.

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

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

7. The workers finally tried to spray water up to 100 feet to quench the gas (which is water soluble). But the gas was escaping from the chimney of 120-feet high.

8. The workers were not trained on safety drills or emergency drills or any evacuation plans. The gas escaped into the air and spread over 40 sq. km. About 600 people died and left 7000 injured and the health of about 2 million people was affected adversely. Even after 22 years, influence of the Central Government and the courts, the compensation had not reached all the affected people.

8. Explain in detail about moral leadership.

Engineers provide many types of leadership in the development and implementation of technology, as managers, entrepreneurs, consultants, academics and officials of the government. Moral leadership is not merely the dominance by a group. It means adopting reasonable means to motivate the groups to achieve morally desirable goals. This leadership presents the engineers with many challenges to their moral principles.

Moral leadership is essentially required for the engineers, for the reasons listed as follows:

1. It is leading a group of people towards the achievement of global and objectives. The goals as well as the means are to be moral. For example, Hitler and Stalin were leaders, but only in an instrumental sense and certainly not on moral sense.

2. The leadership shall direct and motivate the group to move through morally desirable ways.

3. They lead by thinking ahead in time, and morally creative towards new applications, extension and putting values into practice. 'Morally creative' means the identification of the most important

values as applicable to the situation, bringing clarity within the groups through proper communication, and putting those values into practice.

4. They sustain professional interest, among social diversity and cross-disciplinary complexity. They contribute to the professional societies, their professions, and to their communities. The moral leadership in engineering is manifested in leadership within the professional societies. The professional societies provide a forum for communication, and canvassing for change within and by groups.

5. Voluntarism: Another important avenue for providing moral leadership within communities, by the engineers is to promote services without fee or at reduced fees (pro bono) to the needy groups. The professional societies can also promote such activities among the engineers. This type of voluntarism (or philanthropy) has been in practice in the fields of medicine, law and education. But many of the engineers are not self-employed as in the case of physicians and lawyers. The business institutions are encouraged to contribute a percentage of their services as free or at concessional rates for charitable purposes.

6. Community service: This is another platform for the engineers to exhibit their moral leadership. The engineers can help in guiding, organising, and stimulating the community towards morally- and environmentally-desirable goals. The corporate organizations have come forward to adopt villages and execute many social welfare schemes, towards this objective.

The Codes of Ethics promote and sustain the ethical environment and assist in achieving the ethical goals in the following manner:

1. It creates an environment in a profession, where ethical behavior is the basic criterion.

2. It guides and reminds the person as to how to act, in any given situation.

3. It provides support to the individual, who is being pressurized or tortured by a superior or employer, to behave unethically.

4. Apart from professional societies, companies and universities have framed their own codes of ethics, based on the individual

circumstances and specific mission of the organisations. These codes of conduct help in employees' awareness of ethical issues, establish, and nurture a strong corporate ethical culture.

9. Explain in detail about codes of ethics.

(APRIL/MAY 2017)

10. CODES OF ETHICS

Preamble

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

I Fundamental Canons

Engineers in the fulfillment of their professional duties shall

1. Hold paramount the safety, health, and welfare of the public.
2. Perform services only in areas of their competence.
3. Issue public statements only in objective and truthful manner.
4. Act for each employer or client as faithful agents or trustees.
5. Avoid deceptive acts.
6. Conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession.

II Rules of Practice

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

(a) If engineers' judgment is overruled under circumstances that endanger life or property, they shall notify their employer or client and such other authority as may be appropriate.

(b) Engineers shall approve only those engineering documents that are

in conformity with applicable standards.

(c) Engineers shall not reveal facts, data, or information without prior consent of the client or employer except as authorized or required by law or this code.

(d) Engineers shall not permit the use of their name or associate in business ventures with any person or firm that they believe are engaged in fraudulent or dishonest enterprise.

(e) Engineers shall not aid or abet the unlawful practice of engineering by a person or firm.

(f) Engineers having knowledge of any alleged violation of this Code shall report thereon to appropriate professional bodies and when relevant, also to public authorities, and cooperate with the proper authorities in furnishing such information or assistance as may be required.

2. Engineers shall perform services only in the areas of their competence.

(a) Engineers shall undertake assignments only when qualified by education or experience in the specific technical fields involved.

(b) Engineers shall not affix their signatures to any plans or documents dealing with the subject matter in which they lack competence, nor to any plan or document not prepared under their direction and control.

(c) Engineers may accept assignments and assume responsibility for coordination of an entire project and sign and seal the engineering documents for the entire project, provided that each technical segment is signed and sealed only by the qualified engineers who prepared the segment.

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

(a) Engineers shall be objective and truthful in professional reports, statements, or testimony. They shall include all relevant and pertinent information in such reports, statements, or testimony, which should bear the date indicating when it was current.

(b) Engineers may express publicly technical options that are founded upon knowledge of the facts and competence in the subject matter.

(c) Engineers shall issue no statements, criticisms, or arguments on technical matters that are inspired or paid for by interested parties

on prefaced their comments by explicitly identifying the interested parties on whose behalf they are speaking and by revealing the existence of any interest the engineers may have in the matters.

4. Engineers shall at for each employer or client as faithful agents or trustees

(a) Engineers shall disclose all known or potential conflicts of interest that could influence or appear to influence their judgment or the quality of their services.

(b) Engineers shall not accept compensation, financial or otherwise, from more than one party for services on the same project, or for services pertaining to the same project, unless the circumstances are fully disclosed and agreed to by all interested parties.

(c) Engineers shall not solicit or accept financial or other valuable consideration, directly or indirectly, from outside agents on connection with the work for which they are responsible.

(d) Engineers in public service as members, advisers, or employees of a governmental or quasi-governmental body or department shall not participate in decisions with respect to services solicited or provided by them or their organizations in private or public engineering practice.

(e) Engineers shall not solicit or accept a contract from a governmental body on which a principal or officer of their organization serves as a member.

5. Engineers shall avoid deceptive acts

(a) Engineers shall not falsify their qualifications or permit misrepresentation of their or their associate's qualifications. They shall not misrepresent or exaggerate their responsibility in or for the subject matter of prior assignments. Brochures or other presentations incident to the solicitation of employment shall not misrepresent pertinent facts concerning employers, employees, associates, joint ventures, or past accomplishments.

(b) Engineers shall not offer, give, solicit or receive, either directly or indirectly, any contribution to influence the award of a contract by public authority, or which may be reasonably construed by the public as having the effect of intent to influence the awarding of a contract. They shall not offer any gift or other valuable

consideration in order to secure work. They shall not pay a commission, percentage, or brokerage fee in order to secure work, except to a bonafide employee or established commercial or marketing agencies retained by them.

III Professional Obligations

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

(a) Engineers shall acknowledge their errors and shall not distort or alter the facts.

(b) Engineers shall advice their clients or employers when they believe a project will not be successful.

(c) Engineers shall not accept outside employment to the detriment of their regular work or interest. Before accepting any outside engineering employment they will notify their employers.

(d) Engineers shall not attempt to attract an engineer from another employer by false or misleading pretenses.

(e) Engineers shall not promote their own interest at the expense of the dignity and integrity of the profession.

2. Engineers shall at all times strive to serve the public interest.

(a) Engineers shall seek opportunities to participate in civic affairs, career guidance for youths, and work for the advancement of the safety, health, and well-being of their community.

(b) Engineers shall not complete, sign, or seal plans and/or specifications that are not in conformity with applicable engineering standards. If the client or employer insists on such unprofessional conduct, they shall notify the proper authorities and withdraw from further service on the project.

(c) Engineers shall endeavour to extend public knowledge and appreciation of engineering and its achievements.

3. Engineers shall avoid all conduct or practice that deceives the public.

(a) Engineers shall avoid the use of statements containing a material mis-representation of fact or omitting a material fact.

(b) Consistent with the foregoing, engineers may advertise for recruitment of personnel.

(c) Consistent with foregoing, engineers may prepare articles for the lay or technical press, but such articles shall not imply credit to the author for work performed by other.

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

   (a) Engineers shall not, without the consent of all interested parties, promote or arrange for new employment or practice in connection with a specific project for which the engineer has gained particular and specialized knowledge.

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

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

   (a) Engineers shall not accept financial or other consideration including free engineering designs, from material or equipment suppliers for specifying their product.

   (b) Engineers shall not accept commission or allowances, directly or indirectly, from contractors or other parties dealing with clients or employers of the engineer in connection with work for which the engineer is responsible.

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

   (a) Engineers shall not request, propose, or accept a commission on a contingent basis under circumstances in which their judgement may be compromised.

   (b) Engineers in salaried positions shall accept part-time engineering work only to the extent consistent with policies of the employer and in accordance with ethical consideration.

(c) Engineers shall not, without consent, use equipment, supplies, laboratory, or office facilities of an employer to carry on outside private practice.

7. Engineers shall not attempt to injure, maliciously or falsely, directly or indirectly, the professional reputation, prospects, practice, or employment of other engineers. Engineers who believe others are guilty of unethical or illegal practice shall resent such information to the proper authority for action.

(a) Engineers in private practice shall not review the work of another engineer for the same client, except with the knowledge of such engineer, or unless the connection of such engineer with the work has been terminated.

(b) Engineers in governmental, industrial, or educational employment are entitled to review and evaluate the work of other engineers when so required by their employment duties.

(c) Engineers in sales or industrial employ are entitled to make engineering comparisons or represented products with products of other suppliers.

8. Engineers shall accept personal responsibility for their professional activities, provided, however, the engineers may seek indemnification for services arising out of their practice for other than gross negligence, where the engineer's interests cannot otherwise be protected.

(a) Engineers shall conform to state registration laws in the practice of engineering.

(b) Engineers shall not use association with a non-engineer, a corporation, or partnership as a 'cloak' for unethical acts.

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

(a) Engineers shall, whenever possible, name the person or persons who may be individually responsible for designs, inventions, writings, or other accomplishments.

(b) Engineers using designs supplied by a client recognize that the designs remain the property of the client and may not be duplicated by the engineer for others, without the express permission.

(c) Engineers before undertaking work for others in connection with which the engineer may make improvements, plans, designs, inventions, or other records that may justify copyrights or patents, should enter into a positive agreement regarding ownership.

(d) Engineers' designs, data, records, and notes referring exclusively to an employer's work are the employer's property. The employer should indemnify the engineer for use of the information for any purpose other than the original purpose.

(e) Engineers shall continue their professional development throughout their careers and should keep current in their specialty fields by engaging in professional practice, participating in continuing education course, reading in the technical literature, and attending professional meetings and seminars.

10. Explain in detail the various advantages and disadvantages of MNC's?(April/May 2018)

MULTINATIONAL CORPORATIONS

A multinational corporation (MNC), also called a transnational corporation (TNC), or multinational enterprise (MNE), is a corporation or an enterprise that manages production or delivers services in more than one country. It can also be referred to as an international corporation. The International Labour Organization (ILO) has defined[citation needed] an MNC as a corporation that has its management headquarters in one country, known as the home country, and operates in several other countries, known as host countries.

The Dutch East India Company was the first multinational corporation in the world and the first company to issue stock. It was also arguably the world's first megacorporation, possessing quasi-governmental powers, including the ability to wage war, negotiate treaties, coin money, and establish colonies.

The first modern multinational corporation is generally thought to be the East India Company. Many corporations have offices, branches or manufacturing plants in different countries from where their original and main headquarters is located.

Some multinational corporations are very big, with budgets that exceed some nations' GDPs. Multinational corporations can have a powerful influence in local economies, and even the world economy, and play an important role in international relations and globalization Multinational corporations have played an important role in globalization.

Market withdrawal

Because of their size, multinationals can have a significant impact on government policy, primarily through the threat of market withdrawal.

Lobbying

Multinational corporate lobbying is directed at a range of business concerns, from tariff structures to environmental regulations. There is no unified multinational perspective on any of these issues.

Patents

Many multinational corporations hold patents to prevent competitors from arising. For example, Adidas holds patents on shoe designs, Siemens A.G. holds many patents on equipment and infrastructure and Microsoft benefits from software patents. The pharmaceutical companies lobby international agreements to enforce patent laws on others.

Government power

In addition to efforts by multinational corporations to affect governments, there is much government action intended to affect corporate behavior. The threat of nationalization (forcing a company to sell its local assets to the government or to other local nationals) or changes in local business laws and regulations can limit a multinational's power.

Micro Multinationals

These multinationals start operating in different countries from the very early stages. These companies are being called micro-multinationals.