



### UNIT I-ENGINEERING ETHICS

#### PART A

##### 1. Define the term Profession.

Profession defines as a Declaration of belief in a course for a job.

##### 2. Discuss the term Professional as Independence.

So long as the individual is looked upon as an employee rather than as a free artisan, to that extent there is no professional status.

##### 3. Discuss the term Professionalism as serving employers.

It is essential that professional should serve rather than filtering their everyday work through a sieve of ethical sensitivity.

##### 4. Discuss the term Professional an intermediate position.

Two general criteria are specified, they are

- Attaining standards of achievements in education, job performance or creativity in engineering that distinguish from engineering technicians and technologists.
- Accepting as part of their professional obligation at least the basic moral responsibilities to the public as well as to their employers, client, colleagues, and subordinates.

##### 5. Define the term Engineering.

Engineering defines as the creative art of applying science for the benefits of the humanities.

##### 6. Define the term Engineer.

Engineer defines, as a person who's Job is to design or built and maintain the equipment using the scientific principles.

##### 7. Specify how the Ethics is classified?

Ethics Classification are done as follows

- Personal
- Corporate
- Professional

##### 8. List some of the Personal Ethics.

Some of the Personal Ethics are

- Copying of Home works and tests
- Copying of video CD's
- Usage of college papers for personal use
- Software piracy
- Income taxes

##### 9. Define the term Ethics.

Term Ethics obtained from the Greek word ethos, which means study of what is wrong and what is right (or) study of good and bad character.

##### 10. Define Engineering Ethics.

Engineering Ethics is

- The study of the moral issues and decisions confronting individuals and organizations engaged in engineering and
- The study of related questions about the moral ideas, character, policies, relationship of people and corporations involved in technological activities.



### 11. What are Three Types of Enquiry?(May 2013)

Three Types of Enquiry are

Normative Enquiry, Factual Enquiry, Conceptual Enquiry

### 12. Explain the Three Types of Enquiry.

- Normative Enquiry is the most central, which seek to identify the values that should guide individuals and groups.
- Conceptual Enquiry are directed towards clarify the meaning of concepts, principles and issues in Engineering Ethics.
- Factual Enquiry or Descriptive Enquiry or Explanatory Enquiry, which seek to uncover information bearing upon value issues and identify the key factors that call for specific actions.

### 13. List some of the examples of Normative Enquiry.

Some of the examples of Normative Enquiry are listed below.

- How far does the obligation of engineers to protect public safety extend in given situations? When if ever should engineers be expected to blow the whistle on dangerous practices and the judgment for whom the work.
- Whose values ought to be primary in making judgments about acceptable risks in a design of public transport system, those of management, senior engineers, voters, or a combination of these.
- Which particular laws and organizational procedures affecting engineering practice are morally warranted?
- What moral rights should engineers be recognized as having in order to help them fulfill their professional obligations.

### 14. Define the term Bribe.

Money or gift given to obtain procure things (that is often dishonest or illegal things). Therefore, the action or decision taken is in favor of the person who had given the bribe.

### 15. List the complexities that are involved in moral situations.(Nov 2012)

Some of the complexities that are involved in moral situations are

- Vagueness
- Conflicting Reasons
- Problems of Disagreement

### What is Moral Dilemmas?

Moral Dilemmas are certain kind of situations in which a difficult choice has to be made for the Moral Problems.

### 17. What are the different levels of moral development suggested by Kohlberg?

The different levels of moral development suggested by Kohlberg are

- Pre-conventional
  - Conventional
  - Post-conventional
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### 18. Define Micro-Ethics.

This term stresses more about some typical and everyday problems, which play an important role in the field of engineering and in the profession of an engineer.



### 19. Define Macro-Ethics.

This term deals with all the social problems which are unknown and suddenly burst out on a regional or national level.

### 20. What are steps used to resolve the Moral Dilemmas?

- There are six steps to resolve the moral dilemmas, they are Identify the problem
  - Identify the potential issues involved
  - Review your organization's code of ethics, policies and local laws
  - Evaluate potential course of action Obtain consultation
  - Determine the best course of action

### 21. Explain Pre-Conventional Level of Kohlberg Theory.

It is the first level, which is based upon desire to derive benefits for one. The strong driving force at this stage is the desire to avoid punishment. People at this level try to act ethically only for self benefit and to avoid caught and punished. This is the development of children and few adults never cross this stage.

### 22. Explain Conventional Level of Kohlberg Theory.

In this level, the moral behavior of the individual is determined by the standards of the family, community, and society. Individuals at this level are motivated by the desire to be approved by others and to meet the expectations of the social unit. Kohlberg says that many individuals do not cross this level.

### 23. Explain Post-Conventional Level of Kohlberg Theory.

In the third level, the individuals are guided by strong principles and convictions but not by selfish needs or pressures from the society. Kohlberg calls the person in this level as Autonomous.

### 24. What are the limitations or difficulties of Kohlberg Theory?

Theoretically, the classification was clear but when it is practically applied, it has some drawbacks namely,

- How to judge the individual belongs to the first, second or the third level. What are the criteria to judge and measure the individual for each level?
- The theory implies that the individual moral level is pre-programmed and inborn. If at all, any level can be changed it is not clear what the factors are.

### 25. Explain Pre-Conventional Level of Gilligan Theory.

It is the first level, which is based upon desire to derive benefits for one. The strong driving force at this stage is the desire to avoid punishment. People at this level try to act ethically only for self benefit and to avoid caught and punished. This is the development of children and few adults never cross this stage. (Same as Kohlberg Theory for this level alone)

### 26. Explain Conventional Level of Gilligan Theory.

Here the basic motive is willingness to sacrifice one's own interests and a strong desire not to hurt others interests. Mostly women come in this category.



### **27. Explain Post-Conventional Level of Gilligan Theory.**

Here the individual strikes a mature balance between the two extremes – self interest on the one hand and sacrifice on the other hand. Here they apply context oriented reasoning like examining all facts, people and circumstances involved, rather than by applying general rules.

### **28. What does Moral Autonomy mean?(May 2013)**

Moral Autonomy means the skill and habit of thinking rationally on ethical issues based on moral concern.

### **29. What do you mean by the term Virtues?**

The moral ideals in which a profession is dedicated specify the Virtues. Virtues are the desirable features of character, which related to other individuals, group, or organizations. They have as much to do with motives, attitudes, and emotions as they do with right or wrong conduct.

### **30. List some of the Models of Professional Roles.**

Some of the Models of Professional Roles are Savior, Guardians, Bureaucratic Servant, and Social Servants, Social enabler and catalyst and Game Players.

### **31. Engineers as Bureaucrat – Discuss.**

The role of engineers is to be a servant who receives and translates the directives of management into concrete achievement. The engineer's special skill resides in solving problems within the constraints assigned by the manager.

### **32. Engineers as Saviors – Discuss.**

Some people taught that a philosopher king is required to create a ideal society and other group believed that engineers hold the key in creating a stopian society.

### **33. Engineers as Guardians – Discuss.**

Engineers know the best direction in which the technology should develop. Accordingly, they give position basis on the experience, so that they can guard the society by doing things that is involved for the best of the society.

### **34. Engineers as Social Servants – Discuss.**

The role of engineers is obedient service to the management but their true master is the society. Society expresses its interest either directly by purchasing products or indirectly through government representation and consumer groups. Engineers in cooperation with the management have the task of receiving society directly and satisfy the society needs.

### **35. Engineers as Social enabler and catalyst – Discuss.**

Engineers are also called as social servant models. Service to the society is not carried out directly; ultimate power and authority lie with management for the engineers. Sometime engineers are needed to help management so that they can understand their own needs to make decisions about technological developments.

### **36. Engineers as Game Players – Discuss.**

Engineers are neither servants nor masters of anyone. Instead they play by the economics game rules that happens to be effective at a given times. Their aim is to play successfully within a



organization, enjoying both the pleasures of technological work and the satisfaction of winning ahead in a competitive world.

### **37. List some of the Models of Professional Roles.**

Some of the Models of Professional Roles are  
Savior □ Guardians, Bureaucratic servant, Social Servants, Social enabler and catalyst Game Players.

### **38. What are the uses of Ethical Theories?**

Some of the uses of Ethical Theories are

- Resolving moral dilemmas
- Justifying moral obligations
- Relating moral and professional morality

### **39. Differentiate between Act-Utilitarianism and Rule-Utilitarianism.**

Act-Utilitarianism will look at each situation to see whether and how far professionals should be allowed to exercise their conscience in pursuing their duties to the public.

Rule-Utilitarianism will seek to establish the best rule or policy in regards to employee rights for promoting the public good.

### **40. Define Ethical Pluralism and Ethical Relativism.**

Ethical Pluralism means there are many views of looking at ethical problems and it is difficult to peg down to one solution, which is acceptable to all.

Ethical Relativism is an action that is moral if it is within the framework of law or custom.

### **41. What is the main goal of Engineering Ethics?**

They should have a clear concept on related theories and standards involved To identify and enlist the types of ethical issues that is likely to occur.

### **42. What is Consensus and Controversy?**

Moral autonomy is the fascinating concept of engineering ethics for professional engineers. When the ethical values are being implemented in practical terms, some consensus and controversial implications and issues arise. The harmonious interaction between engineers and public individuals is the crucial factor for the manifestation of the consensus and controversy.

### **43. What is Ethical Accountability? (MAY 2011)**

Accountability is the highest form of responsibility. In this case, engineer is specifically charged with a certain responsibility, he is duty bound to fulfill it all costs and if he fails, he can be questioned and even punished.

### **44. Explain how moral issues are related with (i) Organization (ii) Environment and (iii) Society**

- (i) Organizational Related: Most of the engineers are not self-employed, they are employees of some organization or other. As an employee, an Engineer should utilize his / her skills in the benefit of the organization and should take decisions in the interest of the organization.
- (ii) Environment Related: It is very essential to use the resources carefully without depleting them. An engineer should take care of not to spoil the nature resources.



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(iii) Society Related: An engineer is expected to have a certain amount of social responsibility in addition to his core activities. Thus, his motive should not be solely to earn money at the cost of society interest.

### **45. What are the Significances of Engineering Ethics? (May 2011)**

The rules & standards governing the conduct of engineers in their role as professionals. It is a body of philosophy indicating the ways that engineers should conduct themselves in their professional capacity.

### **46. What is meant by Normative Enquiry? (May 2011)**

Normative Enquiry is the most central, which seek to identify the values that should guide individuals and groups.

### **47. State the various approaches to engineering ethics (Nov 2011)**

Activity and area of inquiry, distinguishing moral from non moral problems, set of beliefs, attitudes and habits and moral problems in engineering.

### **48. What are conceptual enquiries? (Nov 2011)**

Conceptual Enquiry are directed towards clarify the meaning of concepts, principles and issues in Engineering Ethics.

### **49. Distinguish self respect and self esteem? (Nov 2012)**

Self respect is a moral concept whereas Self esteem is a psychological concept. Self respect refers to the virtue of properly valuing oneself whereas self esteem refers to having a positive attitude towards oneself, the attitude may be excessive or unwarranted.

### **50. Define ethics and mention some universally accepted ethical standards?(NOV 2013)**

Disciple in dealing with what is Wright or wrong or with moral duty and obligation , The thical standards are 1)justifying professional obligation 2)Usefull in expressing every day moral experiences3)Justifying professional morality

## **PART-B**

- 1. Discuss any two case studies on professional disagreements an engineer may encounter and discuss how you would act in that situation.**
- 2. Where and how do moral problems arise in engineering? What is professional responsibility? Discuss theories about virtues. Discuss the scope and aims of Engineering ethics. scope and aim of engineering ethics**
- 3. Professions and professionalism**
- 4. Discuss the theories pertaining to Moral Autonomy with specific reference to consensus and controversy.**
- 5. What is virtue ethics? Explain the virtue and golden mean of Aristotle.**
- 6. What are the theories about morality? Explain briefly about each theory.**
- 7. Discuss in brief the Customs and Religion in engineering ethics.**
- 8. Explain the Four ethical theories**
- 9. Explain in detail about engineering ethics and its philosophy ?**



### UNIT II - ENGINEERING AS SOCIAL EXPERIMENTATION

#### PART A

#### 1. What is the importance of experimentation?

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.

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.



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### **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.

### **20. Explain: 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.

### **21. 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.

### **22. 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

### **23. List some Limitation of codes. (May 2011 / NOV 2011))**

The Limitation of codes is

- Codes are said to be coercive. (Implemented by threaten force)
- Codes are produced is very rapid manner
- Many engineer members of the society are not aware and the existence of the codes of their society and they never goes through it.
- Only few are there in INDIA so we cannot complex them.
- They cannot be taken as final decision.
- Internal conflicts in a body so the rules are not followed.
- Codes are generally restricted be they are general and vague wordings. Therefore, they are not applicable to all situations.

### **24. 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

### **25. Define Engineering Ethics (MAY 2013)(NOV 2013)**

Engineering ethics is the study of moral issues and decisions confronting 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





### 26. 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.

### 27. What are the senses of Engineering ethics? (NOV 2013)

i) It is the activity and discipline aimed at understanding the moral values that ought to guide Engineering practices, resolving moral issues and justifying moral judgment

ii) It is a set of specific moral problems, issues and issues related to Engineering

### PART B

1. Compare and Contrast Engineering Experiments with Standard Experiments.
2. Discuss the problems with law in engineering .
3. What is Proper role of law in Engineering?
4. What are the aspects of engineering that make it appropriate to view engineering projects as experiments?
5. Explain with some examples that engineers would learn not only from their earlier design and operating results but also from those of others engineers.
6. What are the general features of morally responsible engineers? Explain each with appropriate examples?
7. In the Challenger disaster, examine if and how the principle actors behaved as responsible experimenters?
8. What are said to be the main elements included in “Informed Consent”? Enumerate the conditions that would define valid consent.
9. Summarize the relationship between the codes and the experimental nature of engineering in concurrence with the limitations?
10. Explain the code of ethics?



### UNIT – III-ENGINEER'S RESPONSIBILITY FOR SAFETY

#### PART A

#### 1. What is meant by risk? State the causes of risks (NOV 2011)

A risk is the potential that some thing unwanted and harmful may occur. These days the new risks are the less obvious effects of technology are now making way to public consciousness. The mathematical form is  $R = P * C$ , Causes of risks are job overconfidence, technological complacency, lack of safe exists

#### 2. What is safety? What does relative safety express? (NOV 2011)

A thing is safe if its risks are justified to be acceptable. Thus, a thing is safe if the perceived risk of the person, who judges is less and it is unsafe if the perceived risk are high.

Relative safety indicates the safety the product with respect to similar things.

#### 3. What is the idea behind acceptability?

A risk is acceptable when those affected are generally no longer apprehensive (worried) about it. Apprehensiveness depends to a large extent on how the risk is perceived. This is influenced by the factors as whether the risk is assumed voluntarily, the effects of the knowledge on how the harm is done or job related pressure.

#### 4. What can the engineer do to ensure safety?

Relying on experience was mentioned as most important. However, it is well known that experience gained by one engineer is often not passed on to others. Especially the bad news is not at all passed. Another way of gaining experience is through tests. Under certain situation, it would be a valuable source of information.

#### 5. What are the difficulties of accessing the personal risks?

There are so many difficulties in assessing personal risks particularly in case of involuntary risks. It is very difficult to assess the involuntary personal risks, which are specified in the Examples like Living near a refinery and locating a Nuclear Plant.

#### 6. What are the various analyses that are available for testing the products?

The various analyses that is available for testing the products are

- Scenario Analysis
- Failure Modes and effects Analysis
- Fault Tree Analysis
- Event Tree Analysis

#### 7. What does Minimal Compliance mean?

The fact that proof of negligence is not essential to impose liability is a frightening prospect of most manufacturers. The significance of the strict liability doctrine, as far as engineers are concerned, is that although in many cases it is impossible to test every product, the engineer must weigh the chances of a defect causing serious injury against the cost of eliminating or minimizing the defects in the products. Adhering to accepted practices and observing standards is not sufficient, such behavior is called as minimal compliance.

#### 8. How can you improve the product safety?

Safety is not a written work on the design of a product. The following examples will clearly explain that the safety is not based on the possible but unpredictable features. Introduction of magnetic door catch system on refrigerators. It prevents death by suffocation of children accidentally trapped in them. This magnetic door catch now permits the door to be opened from inside easily. It is also cheaper than the older types of spring locks. The dead-man handles for the drivers in trains to control over the speed of the train.



### 9. Name the techniques are available for reducing risk

A number of techniques are available for reducing risk. Some of them are

Application of inherent safety concepts in design. For example in the case of liquefied gas, storage system the present trend is to replace pressurized storages with cryogenic storage at atmospheric pressure.

Use of diversity and redundancy principles in instrumented protection schemes. Regular inspection and testing of safety systems to ensure reliability.

Training of operating personal and regular audits to ensure workability of the systems and procedures.

Development of a well considered emergency plan together with regular drills to ensure preparedness.

### 10. What are the activities to be performed by the engineers to safeguard the public from risk?

Therefore, the engineer has to do the following activities to safeguard the public from the risks.

Provide the background material to support or to provide the faulty positions and actively take part in the debate.

Act as the model of a science court.

Measure the risks and benefits on a ordinal (relative) scale rather than cardinal (absolute) scale

Ensure the parties affected by the project concerned are polled.

### 11. What are the types of risks?

The risks are classified as

- Under Estimation of Risks
- Over Estimation of Risks
- No Estimation of Risks
- 

### 12. State some IEEE codes of ethics related to the Responsibility and Safety.

The IEEE code of ethics says three points namely,

To accept responsibility in making decision consistent with safety, health, and welfare to the public and to disclose promptly factors that might endanger the public or the environment.

To improve the understanding of technology, its appropriate application and potential sequence.

To maintain and improve the understanding of technology and its appropriate applications.

### 13. What are the safety criteria for safe design to be followed by the engineers?

The safety criteria for safe design that has to be followed by the engineers are

The minimum requirements are that the design must satisfy all the applicable laws. For this the legal standards should be made to known everyone. The engineers should make attempt so that the consumers do not perform misuse of the products. Therefore, the design must be done in such a manner that the misuse is avoided.

Once the product is manufactured, the finished devices should be rigorously tested.

The main thing is that the engineers must take as much time as possible for designing so that he can minimize future risk of injury.

### 14. What is the risk identification procedure?

Linda Fisher formed an agency called Environment Protection Agency (EPA). In that agency the risk identification procedure as follows.

Work place inspection

Management / Worker discussion

Independent audits

If

Job Safety analysis

Hazard and operability studies

Accident Statistics

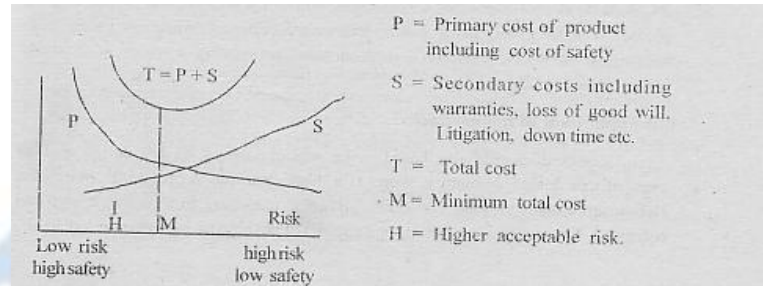


### 15. List some factors which is based on the acceptability of risk.

Some of the factors, which is based for risk are

- Voluntarism and Control
  - Effect of Information on Risk Assessment
  - Job-Related Risks
- Magnitude and Proximity

### 16. Draw the plot between cost and risk.



### 17. What is Scenario Analysis?

It is a general and common approach. In this analysis, when testing the safety of a product, a person has to start from a given point and then to study all the different consequences developed gradually from it.

### 18. What are Failure Models and Effect Analysis?

In this method, a person has to systematically examine the failure models of each part of the product without giving attention on the causes or relationships among the elements of complex systems.

### 19. What is Fault Tree Analysis (FTA)?

It is a pertinent technique in analyzing the primary causes of occurrences of an undesirable situation. It is a just opposite of the above-mentioned method. In this testing, a person has to propose the system failure and then finds out the events back to analyze the possible causes at component level. These methods are more useful in emergency situations.

### 20. What is Event Tree Analysis (ETA)?

It has been found to be very useful in identifying a potentially hazardous situation in the plan. This analysis is the reverse of the fault tree analysis. It is mathematically oriented version of scenario analysis.

### 21. What is Risk Benefit Analysis? (NOV 2012)

RBA is a method that helps the engineer to analyze the risk in a project and to determine whether a project should be implemented or not. It is very much closer to the Cost Benefit Analysis (the quantity of benefits by incurring certain expenditures). In RBA, the risk and benefits of a product are allotted to money amounts and the most beneficial ratio between risk and benefits is calculated.

### 22. Define Safe exit.

“A thing is safe if its risks are judged to be acceptable”. The sense of a degree of safety that satisfies all individuals as groups under all conditions is neither attainable nor affordable.

### 23. Give any two examples of improved safety. (NOV 2012)

Safety is not a written work on the design of a product. The following examples will clearly explain that the safety is not based on the possible but unpredictable features.



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Introduction of magnetic door catch system on refrigerators. It prevents death by suffocation of children accidentally trapped in them. This magnetic door catch now permits the door to be opened from inside easily. It is also cheaper than the older types of spring locks. The dead-man handles for the drivers in trains to control over the speed of the train.

### **24. Define: Safety. (MAY 2013)**

A thing is safe if its risks are justified to be acceptable. Thus, a thing is safe if the perceived risk of the person, who judges is less and it is unsafe if the perceived risk are high.

### **25. What shall be the approach of government Regulator towards risk mitigation? (MAY 2013)**

A number of techniques are available for reducing risk. Some of them are Application of inherent safety concepts in design. For example in the case of liquefied gas, storage system the present trend is to replace pressurized storages with cryogenic storage at atmospheric pressure. Use of diversity and redundancy principles in instrumented protection schemes. Regular inspection and testing of safety systems to ensure reliability.

Training of operating personal and regular audits to ensure workability of the systems and procedures. Development of a well considered emergency plan together with regular drills to ensure preparedness.

### **26. Define disaster?(NOV 2013)**

It is a region disruptive event coincided with the state of insufficient preparation

### **27. What is the use of risk analysis? (NOV 2013)**

To analyse the risk in the project and to decide to continue the project or not

### **PART B**

- 1. Explain in detail about the effect of information on risk assessments?**
- 2. Discuss in detail testing strategies for safety?**
- 3. Discuss in detail “risk benefit analysis and reducing risks?”**
- 4. Would knowledge of risk help you to have better safety standards or safe products? Substitute your arguments with suitable case studies?**
- 5. How to account publicly for benefits and risks?**
- 6. Discuss the motion of “safe exit” using evacuation plans for communities near nuclear power plants or chemical processing plants?**
- 7. What are the safety lessons we can learn from Three Mile Island and Chernobyl safe exits?**
- 8. Explain the study of accidents?**
- 9. What is risk? Discuss its types.**
- 10. Discuss the Engineers’ responsibility for safety**