

# ESE 2017

UPSC ENGINEERING SERVICES EXAMINATION

## Preliminary Examination

**Paper  
I**

**General Studies and  
Engineering Aptitude**

**10**

**Ethics and Values  
in Engineering Profession**

Comprehensive Theory *with* Practice Questions

As per new syllabus of ESE 2017



[www.madeeasypublications.org](http://www.madeeasypublications.org)



### **MADE EASY Publications**

Corporate Office: 44-A/4, Kalu Sarai (Near Hauz Khas Metro Station), New Delhi-110016

E-mail: [infomep@madeeasy.in](mailto:infomep@madeeasy.in)

Contact: 011-45124660, 08860378007

Visit us at: [www.madeeasypublications.org](http://www.madeeasypublications.org)

ESE-2017 : Preliminary Examination

Paper-I : General Studies and Engineering Aptitude

### **Ethics and Values in Engineering Profession**

© Copyright, by MADE EASY Publications.

All rights are reserved. No part of this publication may be reproduced, stored in or introduced into a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photo-copying, recording or otherwise), without the prior written permission of the above mentioned publisher of this book.

1st Edition : 2016

MADE EASY PUBLICATIONS has taken due care in collecting the data and providing the solutions, before publishing this book. In spite of this, if any inaccuracy or printing error occurs then MADE EASY PUBLICATIONS owes no responsibility. MADE EASY PUBLICATIONS will be grateful if you could point out any such error. Your suggestions will be appreciated.

© All rights reserved by MADE EASY PUBLICATIONS. No part of this book may be reproduced or utilized in any form without the written permission from the publisher.

# Preface

The compilation of this book **Ethics and Values in Engineering Profession** was motivated by the desire to provide a concise book which can benefit students to understand the concepts of Ethics and values topics.

This textbook **Ethics and Values in Engineering Profession** provides all the requirements of the students, i.e. comprehensive coverage of theory, fundamental concepts and objective type questions articulated in a lucid language. The concise presentation will help the readers grasp the theory of this subject with clarity and apply them with ease to solve objective questions quickly. This book not only covers the syllabus of ESE but also addresses the need of many other competitive examinations. Topics like 'Ethics for Engineers, Ethical Theories, Human Values, Ethical Dilemmas or Value Conflicts, Responsibilities of Engineers, Environmental Ethics and Codes of Conduct are given full emphasis, keeping in mind of our research on their importance in competitive examinations.

We have put in our sincere efforts to present detailed theory and MCQs without compromising the accuracy of answers. For the interest of the readers, some notes, do you know and interesting facts are given in the comprehensive manner. At the end of each chapter, sets of practice question are given with their keys, that will allow the readers to evaluate their understanding of the topics and sharper their question solving skills.

Our team has made their best efforts to remove all possible errors of any kind. Nonetheless, we would highly appreciate and acknowledge if you find and share with us any printing and conceptual errors.

It is impossible to thank all the individuals who helped us, but we would like to sincerely thank all the authors, editors and reviewers for putting in their efforts to publish this book.



**B. Singh** (Ex. IES)

With Best Wishes

**B. Singh**

CMD, MADE EASY

## **Ethics and Values in Engineering Profession**

### **Chapter 1**

#### **Ethics for Engineers ..... 1**

- 1.1 What is a Profession?..... 1
- 1.2 Engineering and Professionalism..... 2
- 1.3 What is Ethics?..... 3
- 1.4 Professional Ethics ..... 3
- 1.5 Branches of Ethics ..... 6
- 1.6 Why Engineers Need Ethics? ..... 8

### **Chapter 2**

#### **Ethical Theories..... 10**

- 2.1 Introduction ..... 10
- 2.2 Utilitarianism ..... 10
- 2.3 Duty Ethics and Rights Ethics ..... 13
  - 2.3.1 Practice Value of Duty based Approach..... 13
  - 2.3.2 Criticism of Duty based Approach ..... 13
- 2.4 Virtue Ethics ..... 14
  - 2.4.1 Practice Value of Virtue based Approach..... 15
  - 2.4.2 Criticism of Virtue based Approach ..... 15
- 2.5 Distinction between the Three Ethical Theories ..... 17
- 2.6 Which Theory to Use? ..... 18
- 2.7 Ethical Principles that Guide Engineering Practice ..... 18
  - 2.7.1 Respect for Autonomy..... 18
  - 2.7.2 Beneficence ..... 19
  - 2.7.3 Non-maleficence ..... 19
  - 2.7.4 Justice ..... 19
  - 2.7.5 Honesty or Truth Telling..... 19
  - 2.7.6 Fidelity or Promise Keeping..... 19
- 2.8 Indian Ethics ..... 21
- 2.9 Islamic Ethics ..... 21
- 2.10 Buddhist Ethics ..... 22
- 2.11 Virtues for Ethically Responsible Engineers ..... 24
- 2.12 Thinkers ..... 24
  - Swami Vivekananda ..... 24

- Jagadish Chandra Bose ..... 25
- Chandrasekhara Venkata Raman..... 26
- Satyendra Nath Bose..... 27
- Homi Bhabha ..... 27
- Vikram Sarabhai..... 28
- Dr. A. P. J. Abdul Kalam ..... 29
- Aristotle ..... 29
- Immanuel Kant..... 30

### **Chapter 3**

#### **Human Values ..... 31**

- 3.1 Introduction ..... 31
- 3.2 Important Human Values ..... 33
  - 3.2.1 Trust ..... 33
  - 3.2.2 Honesty ..... 34
  - 3.2.3 Forms of Dishonesty ..... 34
  - 3.2.4 Courage ..... 36
  - 3.2.5 Integrity ..... 37
  - 3.2.6 Kindness ..... 40
  - 3.2.7 Forgiveness ..... 40
  - 3.2.8 Humility ..... 40
  - 3.2.9 Gratitude ..... 42
  - 3.2.10 Hope ..... 42
  - 3.2.11 Perseverance ..... 42
  - 3.2.12 Empathy ..... 43
  - 3.2.13 Compassion ..... 43
- 3.3 Values in Engineering Profession ..... 45
  - 3.3.1 Safety, Risk, Accidents..... 45
  - 3.3.2 Human Progress ..... 63
  - 3.3.3 Clean, Clear, Decision Making..... 63
  - 3.3.4 Community..... 63
  - 3.3.5 Partnership with Nature..... 64
- 3.4 Commitment and Cooperation..... 65

## Chapter 4

### **Ethical Dilemmas or Value Conflict ..... 67**

4.1 Introduction .....	67
4.2 Ethical Dilemmas as Distinguished from Moral Temptation .....	68
4.3 Ethically Naive Decision Making.....	68
4.4 Elements of Ethical Dilemmas.....	69
4.5 Values Relevant to Unethical Conduct .....	70
4.6 Conflicts of Interest .....	73
4.7 Responsible Organizational Disobedience.....	75
4.8 Confidentiality and Proprietary Information.....	75
4.9 Whistle Blowing (Disobedience by Protest) .....	76
4.10 Gifts & Bribes .....	79
4.11 Plagiarism .....	81
4.12 Intellectual Property (IP).....	82
4.13 Crime & Punishment.....	83
4.14 Some Individual Unethical Practices.....	83

## Chapter 5

### **Responsibilities of Engineers ..... 87**

5.1 Introduction .....	87
5.2 Responsibility .....	88
(a) Passive Responsibility .....	89
(b) Active Responsibility and the Ideals of Engineers.....	90
5.3 Why Engineers Act Irresponsibly?.....	91
(a) Self-interest .....	91
(b) Fear .....	91
(c) Ignorance .....	91
(d) Uncritical Acceptance of Authority.....	92
(e) Group Think.....	92
(f) Importance of Professional Responsibilities .....	92
5.4 Influence and Power .....	94
5.5 Authority .....	95
5.6 Delegation .....	95
5.7 Professional Rights .....	96
Employee Rights.....	96

## Chapter 6

### **Environmental Ethics ..... 97**

6.1 Introduction .....	97
6.2 Values and the Environment .....	97
6.3 Ethical Dimensions of Environmentalism .....	98
6.4 Tragedy of Commons .....	98
6.5 The Anthrosphere .....	99
Pollution .....	101
Values Involved in Pollution .....	101
6.6 Ethics and Sustainability .....	101
Values and Sustainability .....	102

## Chapter 7

### **Codes of conduct ..... 104**

7.1 Introduction .....	104
7.2 Professional Codes.....	105
7.3 Meaning of Professional .....	106
7.4 Evolution of Codes.....	107
7.5 Values in Codes .....	109
7.6 Possibilities & Limitations of Codes of Conduct.....	110
7.7 Why are Codes of Conduct Morally Binding? .....	111
7.8 NSPE Code of Ethics for Engineers.....	113
7.8.1 Preamble .....	113
7.8.2 Fundamental Canons.....	113
7.8.3 Rules of Practice .....	113
7.8.4 Professional Obligations .....	114
7.9 FEANI Position Paper on Code of Conduct: Ethics and Conduct of Professional Engineers.....	117

## Chapter 8

### **Practice Exercise ..... 120**

### **Glossary ..... 128**



# 2

## CHAPTER

# Ethical Theories

## 2.1 Introduction

Sometimes the engineering world is complex, circumstances ambiguous, and the situation new; thoughtful reflection is needed for ethically sound decision making in these situations. In this case, while reflecting on an actual dilemma, we need expert advice. Philosophy has the expertise in ethics. Philosophy is a “systematic attempt to understand, establish, or defend basic moral principles or rules of conduct, judgments about what is right and wrong” (*American Society for Public Administration*).

Our thinking about ethics rests on three broad philosophical traditions

- **Virtue ethics:** ethics grounded in virtue & moral character
- **Deontology:** duty or principle behind the action
- **Teleology/Utilitarianism:** the consequences of action

## 2.2 Utilitarianism

Utilitarianism holds that those actions are good that serve to maximize human well-being. The emphasis in utilitarianism is not on maximizing the well-being of the individual, but rather on **maximizing the well-being of society as a whole**, and as such it is somewhat of a collectivist approach. An example of this theory that has been played out in India many times over the past century is the building of dams (Multi-purpose Projects). Dams often lead to great benefit to society by providing stable supplies of drinking water, flood control, and economic opportunities. However, these benefits often come at the expense of people who live in areas that will be flooded by the dam and are required to find new homes, or lose the use of their land. Utilitarianism tries to balance the needs of society with the needs of the individual, with an emphasis on what will provide the most benefit to the most people.

Utilitarianism is fundamental to many types of engineering analysis, including risk–benefit analysis and cost–benefit analysis, which we will discuss later. However, as good as the utilitarian principle sounds, there are some problems with it.

- First, as seen in the example of the building of a dam, sometimes **what is best for everyone may be bad for a particular individual or a group of individuals?** An example of this problem is the Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico (US). WIPP is designed to be a permanent repository for nuclear waste generated in the United States. It consists of a system of tunnels bored into underground salt formations. These salt beds are considered by geologists to be extremely stable, especially to incursion of water which could lead to seepage of the nuclear wastes into groundwater. However, there are many who oppose this facility, principally on the grounds that transportation of the wastes across highways has the potential for accidents

that might cause health problems for people living near these routes. An analysis of WIPP using utilitarianism might indicate that the disposal of nuclear wastes is a major problem hindering the implementation of many useful technologies, including medicinal uses of radioisotopes and nuclear generation of electricity. Solution of this waste disposal problem will benefit society by providing improved health care and more plentiful electricity. The slight potential for adverse health effects for individuals living near the transportation routes is far outweighed by the overall benefits to society. So, WIPP should be allowed to open. As this example demonstrates, the utilitarian approach can seem to ignore the needs of individuals, especially if these needs seem relatively insignificant.

- Another objection to utilitarianism is that its **implementation depends greatly on knowing what will lead to the most good**. Frequently, it is impossible to know exactly what the consequences of an action are. It is often impossible to do a complete set of experiments to determine all of the potential outcomes, especially when humans are involved as subjects of the experiments. So, maximizing the benefit to society involves guesswork and the risk that the best guess might be wrong. Despite these objections, utilitarianism is a valuable tool for ethical problem solving, providing one way of looking at engineering ethics cases.

Before ending our discussion of utilitarianism, it should be noted that there are many flavours of the basic tenets of utilitarianism. Two of these are act utilitarianism and rule utilitarianism.

**Act utilitarianism** focuses on individual actions rather than on rules. The best known proponent of act utilitarianism was John Stuart Mill (1806–1873), who felt that most of the common rules of morality (e.g., don't steal, be honest, don't harm others) are good guidelines derived from centuries of human experience. However, Mill felt that individual actions should be judged based on whether the most good was produced in a given situation, and rules should be broken if doing so will lead to the most good.

**Rule utilitarianism** differs from act utilitarianism in holding that moral rules are most important. As mentioned previously, these rules include “do not harm others” and “do not steal.” Rule utilitarian's hold that although adhering to these rules might not always maximize good in a particular situation, overall, adhering to moral rules will ultimately lead to the most good. Although these two different types of utilitarianism can lead to slightly different results when applied in specific situations, in this text, we will consider these ideas together and not worry about the distinctions between the two.

### 2.2.1 Cost–Benefit Analysis

One tool often used in engineering analysis, especially when trying to determine whether a project makes sense, is cost–benefit analysis. **Fundamentally, this type of analysis is just an application of utilitarianism.** In cost–benefit analysis, the costs of a project are assessed, as are the benefits. Only those projects with the highest ratio of benefits to costs will be implemented. This principle is **similar to the utilitarian goal of maximizing the overall good**.

As with utilitarianism, there are problems in the use of cost–benefit analysis. While it is often easy to predict the costs for most projects, the benefits that are derived from them are often harder to predict and to assign a money value to. Once rupee amounts for the costs and benefits are determined, calculating a mathematical ratio may seem very objective and therefore may appear to be the best way to make a decision. However, this ratio can't take into account many of the more subjective aspects of a decision. For example, from a pure cost–benefit discussion, it might seem that the building of a dam is an excellent idea. But this analysis won't

include other issues such as whether the benefits outweigh the loss of a scenic wilderness area or the loss of an endangered species with no current economic value. Finally, it is also important to determine whether those who stand to reap the benefits are also those who will pay the costs. It is unfair to place all of the costs on one group while another reaps the benefits.

**It should be noted that although cost–benefit analysis shares many similarities with utilitarianism, cost–benefit analysis isn’t really an ethical analysis tool. The goal of an ethical analysis is to determine what the ethical path is. The goal of a cost–benefit analysis is to determine the feasibility of a project based on costs. When looking at an ethical problem, the first step should be to determine what the right course of action is and then factor in the financial costs in choosing between ethical alternatives.**

Q.

### Questions for Practice

**Q.1. Statement (I):** A *virtue* is a positive trait or quality deemed to be morally good and thus is valued as a foundation of principle and good moral being.

**Statement (II):** Teleological approach focuses on one’s duty and consider it as the right choice.

- (a) Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I)
- (b) Both Statement (I) and Statement (II) are individually true but Statement (II) is not the correct explanation of Statement (I)
- (c) Statement (I) is true but Statement (II) is false
- (d) Statement (I) is false but Statement (II) is true

**Q.2. Statement (I):** The emphasis in utilitarianism is on maximizing the well-being of the individual.

**Statement (II):** Utilitarianism is fundamental to risk–benefit analysis and cost–benefit analysis.

- (a) Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I)
- (b) Both Statement (I) and Statement (II) are individually true but Statement (II) is not the correct explanation of Statement (I)
- (c) Statement (I) is true but Statement (II) is false
- (d) Statement (I) is false but Statement (II) is true

**Q.3** Consider the following statements:

- 1. Utilitarianism tries to balance the needs of society with the needs of the individual.
- 2. Act utilitarianism focuses on individual actions rather than on rules.
- 3. A problem with utilitarian approach is to know what will cause maximum good.
- 4. According to rule utilitarian, rules should be broken, if doing so will lead to the most good.

Which of the above statements are correct?

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1, 2 and 3 only
- (d) 1, 2, 3 and 4 only

**Q.4** Consider the following statements:

- 1. Two different types of utilitarianism can lead to slightly different results when applied in specific situations.
- 2. In cost–benefit analysis, the costs of a project are assessed, as are the benefits.



3. Cost benefit analysis isn't an ethical analysis tool, but more of an engineering analysis tool.
4. The goal of a cost–benefit analysis is to determine the feasibility of a project based on ethics.

Which of the above statements are correct?

- |                     |                        |
|---------------------|------------------------|
| (a) 1 and 2 only    | (b) 1, 2 and 3 only    |
| (c) 2, 3 and 4 only | (d) 1, 2, 3 and 4 only |

Answers			
1. (c)	2. (d)	3. (c)	4. (b)

## 2.3 Duty Ethics and Rights Ethics

Two other ethical theories—duty ethics and rights ethics—are similar to each other and will be considered together. **These theories hold that those actions are good that respect the rights of the individual.** Here, good consequences for society as a whole are not the only moral consideration.

A major proponent of duty ethics was Immanuel Kant (1724–1804), who held that moral duties are fundamental. Ethical actions are those actions that could be written down on a list of duties: be honest, don't cause suffering to other people, be fair to others, etc. These actions are our duties because they express respect for persons, express an unqualified regard for autonomous moral agents, and are universal principles. Once one's duties are recognized, the ethically correct moral actions are obvious. In this formulation, **ethical acts are a result of proper performance of one's duties.**

Rights ethics was largely formulated by John Locke (1632–1704), whose statement that humans have the right to life, liberty, and property was paraphrased in the Declaration of Independence of the soon-to-be United States of America in 1776. **Rights ethics holds that people have fundamental rights that other people have a duty to respect.**

Duty ethics and rights ethics are really just two different sides of the same coin. Both of these theories achieve the same end: **Individual persons must be respected, and actions are ethical that maintain this respect for the individual.** In duty ethics, people have duties, an important one of which is to protect the rights of others. And in rights ethics, people have fundamental rights that others have duties to protect.

### 2.3.1 Practice Value of Duty based Approach

The duty-based approach has practice value in engineering. For example, as a design engineer, one must always consider the end-user safety and not treat the end-user as mere means to an end. The respect for end-user's safety is morally correct since it acknowledges the inherent value of the end-user.

We could explore the value of this view further with another example: a decision based on ethical duty will be ethically correct even if the end or outcome is wrong as duty is the necessity of acting from respect for the law. Fry and Johnstone, citing Kant, stated that “an action or decision is right if it is done from duty standpoint.”

### 2.3.2 Criticism of Duty based Approach

As with utilitarianism, there are problems with the duty and rights ethics theories that must be considered.

- First the basic rights of one person (or group) may conflict with the basic rights of another group. How do we decide whose rights have priority? Using our previous example of the building of a dam, people have the right to use their property. If their land happens to be in the way of a proposed dam, then rights ethics would hold that this property right is paramount and is sufficient to stop the dam project. A single property holder's objection would require that the project be

terminated. However, there is a need for others living in nearby communities to have a reliable water supply and to be safe from continual flooding. Whose rights are paramount here? Rights and duty ethics don't resolve this conflict very well; hence, the utilitarian approach of trying to determine the most good is more useful in this case.

- The second problem with duty and rights ethics is that these theories don't always account for the overall good of society very well. Since the emphasis is on the individual, the good of a single individual can be paramount compared to what is good for society as a whole. The WIPP case discussed before illustrates this problem. Certainly, people who live along the route where the radioactive wastes will be transported have the right to live without fear of harm due to accidental spills of hazardous waste. But the nation as a whole will benefit from the safe disposal of these wastes. Rights ethics would come down clearly on the side of the individuals living along the route despite the overall advantage to society.

Already it is clear why we will be considering more than one ethical theory in our discussion of engineering cases. The theories already presented clearly represent different ways of looking at ethical problems and can frequently arrive at different solutions. Thus, any complete analysis of an ethical problem must incorporate multiple theories if valid conclusions are to be drawn.

## 2.4 Virtue Ethics

Fundamentally, **virtue ethics is interested in determining what kind of people we should be.** Virtue is often defined as moral distinction and goodness. A virtuous person exhibits good and beneficial qualities. In virtue ethics, actions are considered right if they support good character traits (virtues) and wrong if they support bad character traits (vices). Virtue ethics focuses on words such as responsibility, honesty, competence, and loyalty, which are virtues. Other virtues might include trustworthiness, fairness, caring, citizenship, and respect. Vices could include dishonesty, disloyalty, irresponsibility, or incompetence. As you can see, **virtue ethics is closely tied to personal character.** We do good things because we are virtuous people and seek to enhance these character traits in ourselves and in others.

In many ways, this theory may seem to be mostly personal ethics and not particularly applicable to engineering or professional ethics. However, personal morality cannot, or at any rate should not, be separated from professional morality. If a behaviour is virtuous in the individual's personal life, the behaviour is virtuous in his or her professional life as well.

How can virtue ethics be applied to business and engineering situations? This type of ethical theory is somewhat trickier to apply to the types of problems that we will consider, perhaps because virtue ethics seems less concrete and less susceptible to rigorous analysis and because it is harder to describe nonhuman entities such as a corporation or government in terms of virtue. However, we can use virtue ethics in our engineering career by answering questions such as:

- Is this action honest?
- Will this action demonstrate loyalty to my community and/or my employer?
- Have I acted in a responsible fashion?

Often, the answer to these questions makes the proper course of action obvious. To use virtue ethics in an analysis of an ethical problem, you should first identify the virtues or vices that are applicable to the situation. Then, determine what course of action each of these suggests.

### 2.4.1 Practice Value of Virtue based Approach

The knowledge of ethical theory of virtue has practical value in engineering practice. For example, Aristotle's discussion of virtue centres on good character, which is a quality that makes one a good member of his profession. He often refers to a good moral character as human excellence (Aristotle, 2002). Thus, it will be useful to consider excellence as defining features of one's professional character. In other words, it is the excellent character of engineers that enable them to fulfil their professional and moral obligations. For example, virtue in engineering practice defines excellent character, such as, honesty, integrity, or rightful outcome in a moral situation as opposed to wrongful act or decision brought about by wickedness, dishonesty, or being inconsiderate.

The role of the virtuous engineer is shown to be one that necessitates appropriate application of intellectual and practical virtues such as justice, reflection, perception, judgement, bravery, prudence, liberality, and temperance. Furthermore, the ethical virtues, such as honesty, fairness, and impartiality, are valuable to engineering practice because of the goals they serve. Virtue ethics serves the goal of offering professionals a model of good character that they must obey in order to be moral and provides a better approach to ethics because it puts to prominence an engineer's character rather than on rules, principles, and laws.

### 2.4.2 Criticism of Virtue based Approach

- One of the criticisms of ethical theory of virtue is the following question of what is the right sort of character a person should have? Majority of virtue theorists have treated the answer to this question as self-evident. However, one scholar suggested that one man's virtue may be another man's vice and vice versa.
- Another criticism is the difficulties involved with establishing the nature of the virtues. What constitutes virtue depends on different people, cultures, and societies. Different cultures seem to provide different models of moral virtue, and there may be several, some conflicting, within a given culture.
- The virtue-based theory has also been criticised for not considering the sort of actions that are morally allowed and those that are not allowed, but rather focuses on the sort of qualities one is expected to foster in order to become a virtuous person.
- Virtue ethicists are not chiefly concerned with what rule one follows or what penalty one incurs, but what kind of person one is, for example, generous or stingy, courageous or cowardly, moderate or weak-willed, or self-indulgent.
- Lastly, virtue ethics does offer action guidance individuals must follow in order to be moral.

**Q.**

### Questions for Practice

**Q.1 Statement (I):** Duty ethics was mainly formulated by Immanuel Kant.

**Statement (II):** In duty people have duties, an important one of which is to protect the rights. And in rights ethics, people have fundamental rights that others have duties to protect.

- (a) Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I)
- (b) Both Statement (I) and Statement (II) are individually true but Statement (II) is not the correct explanation of Statement (I)

- (c) Statement (I) is true but Statement (II) is false
- (d) Statement (I) is false but Statement (II) is true

**Q.2 Statement (I):** A major proponent of rights ethics was Immanuel Kant.

**Statement (II):** In duty and right ethics, the good of a single individual can be paramount compared to what is good for society as a whole.

- (a) Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I)
- (b) Both Statement (I) and Statement (II) are individually true but Statement (II) is not the correct explanation of Statement (I)
- (c) Statement (I) is true but Statement (II) is false
- (d) Statement (I) is false but Statement (II) is true

**Q.3 Statement (I):** Duty ethics and rights ethics are different sides of the same coin, yet they achieve the same result.

**Statement (II):** In virtue ethics, actions are considered right if they support good character traits and wrong if they support bad character traits.

- (a) Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I)
- (b) Both Statement (I) and Statement (II) are individually true but Statement (II) is not the correct explanation of Statement (I)
- (c) Statement (I) is true but Statement (II) is false
- (d) Statement (I) is false but Statement (II) is true

**Q.4 Statement (I):** An action or decision is right if it is done from duty standpoint, even if it leads to wrong consequences.

**Statement (II):** For an engineer, an end user can be treated as a means to an end.

- (a) Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I)
- (b) Both Statement (I) and Statement (II) are individually true but Statement (II) is not the correct explanation of Statement (I)
- (c) Statement (I) is true but Statement (II) is false
- (d) Statement (I) is false but Statement (II) is true

**Q.5** Consider the following statements:

1. Any complete analysis of an ethical problem must incorporate only a single theory if valid conclusions are to be drawn.
2. Vices might include trustworthiness, fairness, caring, citizenship, and respect.
3. Virtue ethics is difficult to be applied to business and engineering situations because it is harder to describe nonhuman entities such as a corporation or government in terms of virtue.
4. Utilitarianism is a better approach to ethics because it puts to prominence an engineer's character rather than on rules, principles, and laws.

Which of the above statements is/are correct?

- (a) 1, 2 and 3 only
- (b) 2, 3 and 4 only
- (c) 3 only
- (d) 1, 2, 3 and 4

**Q.6** Consider the following statements:

1. Individual qualities rather than action are the prime focus in solving virtue ethics problem.
2. According to virtue ethics do good things because we are virtuous people.
3. Aristotle’s discussion of virtue centres on good character.

Which of the above statements are correct?

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

**Q.7** Consider the following statements:

1. The ethical virtues, such as honesty, fairness and impartiality are valuable to engineering practice because of the goals they serve.
2. One man’s virtue may be another man’s vice and vice versa.
3. Virtue ethics does offer action guidance individuals must follow in order to be moral.

Which of the above statements are correct?

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

Answers						
1. (b)	2. (d)	3. (b)	4. (c)	5. (c)	6. (d)	7. (d)

### 2.5 Distinction between the Three Ethical Theories

The distinction between the three ethical theories could be illustrated using a narrative base on a former bank staff that went into the bank and started shooting his former colleagues in revenge for dismissal. When the armed policemen arrived, he grabbed one of the bank customers as a human shield whilst he continued to kill people that he held as hostages. Is it better for the policemen to take a chance and kill him with his human shield to save the lives of the remaining people held hostage in the building or to wait for negotiation or after he had finished and killed the human shield and himself?

- The human shield is an innocent customer and do not deserve to die and so were many bank customers and staff who were killed because the armed policemen who could have stopped the massacre were clinging to deontological ideals and focused on saving the life of one person used as shield as opposed to saving the lives of many that died. Deontology ethicist would maintain that it is wrong to kill the innocent human shield that does not need to die, even if it is necessary to save more lives. The truth is that by so doing, the policemen have allowed the killing of more innocent people.
- Utilitarian ethicists would argue that the right action is always the action that has the consequence of making as many people as possible happy. Thus, killing the gun man and his human shield means taking two lives to save many would fit in well with utilitarian ideal “end justifies the means” sort of situation.
- A virtue ethicist on the other hand, would focus less on the act of killing and instead consider what a decision to kill or not to kill the innocent human shield said about the character and moral behaviour of the policemen.
- The distinction between consequential, deontological, and virtue ethics is important because when it comes to making a moral decision about whether to behave in a certain way or refrain from

certain behaviour in a given situation, engineers need to be guided, and ethical theories provide necessary guide that would point them in the right direction. For example, consequential theory is outcome based, which concern morality of a decision and the consequences of the outcome. Deontological theory of ethics places emphasis on following rules, and doing one's duty. The ethical theory of virtue concerns desirable characteristics, which one should have as moral or virtuous person.

## 2.6 Which Theory to Use?

Now that we have discussed four different ethical theories, the question arises: How do we decide which theory is applicable to a given problem? The good news is that in solving ethical problems, we don't have to choose from among these theories. Rather, we can use all of them to analyse a problem from different angles and see what result each of the theories gives us. This allows us to examine a problem from different perspectives to see what conclusion each one reaches. Frequently, the result will be the same even though the theories are very different. Take, for example, a chemical plant near a small city that discharges a hazardous waste into the groundwater. If the city takes its water from wells, the water supply for the city will be compromised and significant health problems for the community may result. Rights ethics indicates that this pollution is unethical, since it causes harm to many of the residents. A utilitarian analysis would probably also come to the same conclusion, since the economic benefits of the plant would almost certainly be outweighed by the negative effects of the pollution and the costs required to ensure a safe municipal water supply. Virtue ethics would say that discharging wastes into groundwater is irresponsible and harmful to individuals and so shouldn't be done. In this case, all of the ethical theories lead to the same conclusion. What happens when the different theories seem to give different answers? This scenario can be illustrated by the discussion of WIPP presented previously. Rights ethics indicated that transporting wastes through communities is not a good idea, whereas utilitarianism concluded that WIPP would be beneficial to society as a whole. This is a trickier situation, and the answers given by each of the theories must be examined in detail, compared with each other, and carefully weighed. After thorough analysis using all of the theories, a balanced judgment can be formed.

## 2.7 Ethical Principles that Guide Engineering Practice

### ***\*Principle: a general law or rule that provides a guide for action***

There are ethical principles that guide engineering practice and they are the principles of respect for autonomy, beneficence, non-maleficence, and justice. As ethical dilemmas often arise when principles conflict, therefore in this part we shall discuss those principles that more than often guides an engineer in making an ethically justifiable action.

### 2.7.1 Respect for Autonomy

In a literal sense, autonomy means self-rule or self-determination. According to Beauchamp and Childress, a person should have the right to hold his or her own views, make choices, and take actions based on personal values and beliefs. This means that every individual has the right to express themselves, make their own choices, and take actions based on their own preferences, personal values, and cultural beliefs. As stated by Immanuel Kant, people should be treated as ends in themselves and never merely as means to some end.

The principle requires that we respect that we respect the autonomy of others. It asserts a right of non-interference and correlatively an obligation not to constrain or interfere with the autonomous actions of others.

It is based on the idea that persons possess “autonomy,” that is, they are free, self-governing, and self-determining beings. An individual is autonomous in the absence of internal or external constraints that would compromise the ability to act voluntarily toward a chosen course of action or to fulfil a chosen life-span.

### 2.7.2 Beneficence

The ethical principle of beneficence places a moral obligation upon one to do what is considered good and prevent harm to others. In the words of Beauchamp and Childress, “the principle of beneficence refers to a moral obligation to act for the benefit of others.” It refers to decisions taken for the benefit of others, and is closely associated with mercy, kindness, charity, altruism, love, benevolence, empathy, understanding, and humanity.

The principle of beneficence is a positive injunction that imposes obligations both to provide benefits and to prevent and remove harms. According to William Frankena, the principle of beneficence imposes four duties:

- One ought not to inflict evil or harm
- One ought to prevent evil or harm
- One ought to remove evil
- One ought to do or promote good

### 2.7.3 Non-maleficence

The principle of non-maleficence requires that a person do not intentionally or deliberately, do harm to others. According to the 19th century philosopher J S Mill, we can “cause evil” to others by both our actions and our inactions. General usage of this principle refers to harms caused through actions, that is, positive acts or commissions, and not through our inactions, or omissions. For example, the duty of non-maleficence requires that we forebear from inflicting harm or injury on others by stealing from them or assaulting them, but it does not require that we rescue a person who is drowning. Thus, the principle of non-maleficence is sometimes referred to as a negative injunction since it tells us what not to do.

### 2.7.4 Justice

Gillon has interpreted the principle of justice as fair distribution of resources (distributive justice), respect for people’s rights (rights based justice), and respect for morally acceptable laws (legal justice). We may not follow this particular order in the discussion of ethical principle of justice. Justice could be defined simply as moral obligation to act on the basis of fairness. It refers to the duty to treat people equitably and according their needs. It is a common knowledge that equality is at the heart of justice, but as Aristotle argued, justice is more than mere equality as people can be treated unjustly even when they are treated equally. Justice and equity can be seen as synonymous and imply that everyone should have an opportunity to attain his or her full potential for health and other aspects of life.

Injustice, on the other hand, means a wrongful act or omission that denies people their due benefits or fails to distribute burdens fairly. Injustice also means treating people unfavourably because of their age, health status, ethnicity, gender, disability, and so on.

### 2.7.5 Honesty or Truth Telling

The principle requires full and impartial disclosure of any information that could be considered legitimately important to others.

### 2.7.6 Fidelity or Promise Keeping

Recognises an obligation to honour *just* agreements and keep promises freely entered into and deliberately made.