

# ESE 2021

UPSC ENGINEERING SERVICES EXAMINATION

## Preliminary Examination

### General Studies and Engineering Aptitude

### Ethics and Values in Engineering Profession

Comprehensive Theory *with* Practice Questions  
*and* ESE Solved Questions





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### **ESE 2021 Preliminary Examination : Ethics and Values in Engineering Profession**

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1st Edition : 2016

2nd Edition : 2017

3rd Edition: 2018

4th Edition: 2019

**5th Edition: 2020**

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# 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 this specific topic of General Studies and Engineering Aptitude section.

This textbook 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 in a holistic manner but is also useful for many other competitive examinations. All the topics are given the emphasis they deserve so that mere reading of the book clarifies all the concepts.

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 are given in the comprehensive manner. Each chapter contains sets of practice questions with their answer keys, that will allow the readers to evaluate their understanding of the topics and sharpen 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 Group

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# 2

## Ethical Theories

### INTRODUCTION

Sometimes the engineering world is complex, circumstances are ambiguous, and the situation is new; for that 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.

Our thinking about ethics rests on three broad philosophical traditions:

***Virtue ethics:*** ethics grounded in virtue and moral character.

***Deontology:*** duty or principle behind the action.

***Teleology/Utilitarianism:*** the consequences of action.

### 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.

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.

### 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.

## CHECK YOUR PROGRESS

- Q.1 Utilitarianism adopts an individualistic approach. [True/False]
- Q.2 A collectivist approach does not necessarily mean good for the individual. [True/False]
- Q.3 Rule utilitarianism focuses on \_\_\_\_\_.
- Q.4 Individual actions must be judged on whether they got the job done. [True/False]
- Q.5 There are rules when practicing act utilitarianism. [True/False]

### Answers

1. False    2. True    3. Rules    4. False    5. False

## 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.

### 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."

### 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 earlier in this chapter 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.

### CHECK YOUR PROGRESS

- Q.1 Once one's duties are recognised, one's moral actions become obvious. [True/False]
- Q.2 Duty and Rights ethics are two sides of the same coin – people have \_\_\_\_ which is to protect the \_\_\_\_ of individuals.
- Q.3 Ethical acts are not a result of the proper performance of one's duties alone. [True/False]
- Q.4 Duty is defined as the act of performing actions that has no regard for the law but only individual needs. [True/False]
- Q.5 Determining the needs and their paramountcy can be a major issue in duty and rights ethics. [True/False]

### Answers

1. True      2. Duty/right      3. False      4. False      5. True



## 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.

### Classification of Virtues

Virtues may be classified according to the different springs of action viz., (a) Self-regarding Virtues (b) Other-regarding or altruistic Virtues. (c) Ideal-regarding Virtues.

- (a) Self-regarding Virtues: Virtues of this class are conducive to the agent's own good. The fundamental Virtue is prudence or rational self-love (with self control). It consists in a proper regard for the interests of the self- a regard for the good of the self in abstraction from the good of others. This fundamental virtue expresses itself in and comprises the following subordinate virtues.
- (i) Courage: Courage is the power of resisting the fear of pain. It is this which enables the self to undergo present pains and dangers for the attainment of greater future benefits and realisation of higher and more permanent ends.
  - (ii) Temperance: Temperance is the power of resisting the allurements of pleasure. It consists in the power of resisting the impulses of pleasure, especially of the lower kind which would interfere with the well-being of the self. Thus, temperance is self-discipline as well as single minded devotion to one purpose. 'Self-control is the best control-' So goes the saying.
  - (iii) Perseverance: Perseverance is the power of carrying on a task under the persecution of pains and obstructions. It is the power of resisting the present desires of ease and happiness in order to obtain higher and more permanent good by the exercise of one's own physical and mental powers.
- (b) Other-regarding or Altruistic Virtues: The other-regarding virtues mean the tendencies of the self to regulate its conduct so as to promote the good of others. They include -
- (a) Justice or the willingness of giving each man his due. Justice consists in not hindering the personal life of others. It is non-interference with the free development of other persons. It is generally used in the sense of fairness, equity, impartiality. In a wide sense, it comprises all those virtues which have their ground in the idea and feeling of fairness or justice, such as gratitude, veracity, fidelity, honesty in the dealings with fellowmen, uprightness and integrity.
  - (b) Benevolence: Benevolence consists in helping and furthering the personal life of others. It means sympathy, fellow- feeling and love. Fellow-feeling has various applications. In the first place, there is fellow-feeling arising out of natural relations. In other words, fellow-feeling towards those to whom one is involuntarily related i.e. naturally and necessarily connected by birth and circumstances viz, family, community, nation and human race. Secondly, there is fellow feeling

**ETHICAL STANDARDS**

- Ethical standards are principles that when followed, promote values such as trust, good behavior, fairness, and/or kindness. There is not one consistent set of standards that all companies follow, but each company has the right to develop the standards that are meaningful for their organization. They are not always easily enforceable, as they are frequently vaguely defined and somewhat open to interpretation.
- Ethical standards guide individuals and the company to act in an honest and trustworthy manner in all interactions. These standards should encourage employees to make the right decisions for the company, not the individual, and give them the courage to come forward when they notice dishonest and unethical behavior.

**ESE Prelims Questions**

- Q.1** Consider the following factors in making ethical judgement:
1. The motive from which the action springs
  2. The nature of the act itself, including the means adopted
  3. The resulting consequences
- Which of the above factors are correct?
- (a) 1 and 2 only                      (b) 1 and 3 only  
(c) 1, 2 and 3                      (d) 2 and 3 only

[ESE Prelims : 2017]

Ans. (c)

- Q.2** **Statement (I):** What is legal may not always be ethical.  
**Statement (II):** Ethical standards and the law, share the same theme, i.e., what is permissible and impermissible.
- (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

[ESE Prelims : 2018]

Ans. (b)

- Q.3** Which one of the following statement is correct with respect to 'the convergence theory' on social change?
- (a) The societal adaptive culture is changing more slowly  
(b) As societies become modernized, they begin to resemble one another more closely  
(c) The developed countries show more growth in social changes than the less developed countries  
(d) Strong opposition by old people retards the social change

[ESE Prelims : 2019]

Ans. (b)

- Q.4** 'Utilitarianism' in the professional ethics is
- (a) an acquired habit that helps to lead a rational life  
(b) a skill to solve a current ethical problem by comparing it with similar problems from the past and their outcome

- (c) a right of activists to decide their own duties
- (d) a judgment of an action by the consequences of that action

[ESE Prelims : 2020]

Ans. (d)

Q.5 The basic ethical principle of 'Beneficence' states that

- (a) all our thoughts and actions must be directed to ensure that others benefit from these thoughts and actions
- (b) our actions must result in the least harm to the others
- (c) we should not impose our views on others
- (d) our actions must be fair to everyone

[ESE Prelims : 2020]

Ans. (a)

### Q. Questions for Practice

Q.1 Consider the following statements:

1. Utilitarianism holds that those actions are only good that maximise individual well-being
2. It practices a more collectivist approach
3. This particular theory may not be of use for various engineering analyses

Select the options that are NOT correct using the codes given below:

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

Q.2 **Statement (I):** The engineering world is complex and mostly ambiguous. An engineer often finds himself in situations of dilemma.

**Statement (II):** Philosophy which has the expertise in ethics has the ability to provide a way out of any such conundrums.

- (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 Utilitarianism:

1. Provide most benefit to the most people
2. Emphasises on need of society

3. Balances need of society with the needs of the individual
4. Takes up an individualistic approach
5. Provides fundamentals in the cost-benefit and risk-benefit analyses

Select the correct answer using the codes given below:

- (a) 1 and 2 only
- (b) 1, 2, 3 and 5 only
- (c) all are correct
- (d) 1, 2, 3 and 5 only

Q.4 Consider the following statements:

1. Rule utilitarianism focuses only on the common rules of morality
2. Rules of morality are imbibed through years of human experience and they are flexible
3. According to John Stuart Mill, most good produced is absolute morality

Select the correct answer using the codes given below:

- (a) 1 only
- (b) 2 only
- (c) 3 only
- (d) all are correct

Q.5 Which of the following statements are not correct? Cost-Benefit Analysis:

1. Is based on principle of Deontology
2. Focuses on maximising overall good
3. Is an ethical analysis tool
4. Is used to determine costs of a project based on ethics

- (c) being committed to citizen's interest
- (d) all the above

**Q.13** Reckless actions leading to harm are considered:

- (a) Negligent
- (b) Unintentional
- (c) outside the domain of ethics
- (d) none of the above

**Q.14** Virtue ethics focuses on the obligation of:

- (a) transcending oneself
- (b) transgressing oneself

- (c) treating oneself with respect
- (d) surpassing oneself

**Q.15** Which of the following are the virtues associated with an engineer?

- (a) Objectivity      (b) impartiality
- (c) non-partisanship      (d) all the above

#### Answers

- |         |         |         |         |         |
|---------|---------|---------|---------|---------|
| 1. (d)  | 2. (a)  | 3. (d)  | 4. (d)  | 5. (c)  |
| 6. (b)  | 7. (a)  | 8. (b)  | 9. (d)  | 10. (b) |
| 11. (d) | 12. (c) | 13. (a) | 14. (a) | 15. (d) |

