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EPP (2-0-0) - 30 hrs

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✓ 1.	Society and Technology	6 hrs
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✓ 3.	Roles of professional organizations in Regulation and professional Development	4 hrs
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1 Society and Technology

Society

- Society refers to group of individuals who share a common culture, geographic location and social structure.
 - Members of society interact with each other through social relationships, institutions, and shared norms and values.
 - Societies can be large or small and can be based on a variety of factors, such as language, ethnicity, religion, or economic systems.
 - Societies can exist at various levels, ranging from small, tight-knit communities to global networks of individuals and organizations.
 - Society is a complex phenomenon that is shaped by historical, cultural, economic, and political factors, and is constantly evolving and changing over time.
- Engineers are the men who down the long centuries have learned to exploit the properties of matters and sources of power for the benefits of mankind.
- The civilization as we know today owes its existence to the engineers. By organized, rational efforts to use the materials world around them, engineers devised the myriad comforts and conveniences that mark the differences between our lives and those of our fore-fathers thousands of years ago.

- Engineers work in the society and the society if populations.
- Therefore, one should understand society and its components.
- Society is a population that occupies a certain territory that is subject to the same political authority and the ~~are~~ participate in common culture.

So, a society has the following Criteria:

- It has populations.
- The population must occupy a common territory.
- The population must share the same government or political authority and.
- The population must share the same government or political authority.
- The population must, to some extent, have a common culture, and a sense of relationship/membership in and commitment to the same group.

Types of Society:

There are several ways to classify types of societies, and each classification scheme has its own set of categories. Here are few commonly used classification schemes and their associated types of societies.

A) Based on the level of technological development:

1) Hunter-gatherer societies:-

Societies that rely on hunting, fishing and gathering wild plants for subsistence.

2) Agrarian societies:-

Societies that rely on agriculture for subsistence.

3) Industrial societies:

Societies that rely on mechanized production and manufacturing for subsistence.

B) Based on the level of economic development:

1) preindustrial societies:

Societies that are primarily agrarian or hunter-gatherer.

2) Industrial societies:-

Societies that have achieved industrialization and rely on manufacturing and mass production.

3) post-industrial societies:

Societies that have moved beyond industrialization and rely on information, technology and service industries.

c) Based on social structure:

1) Tribal societies (जनजातीय)

Societies organized around kinship or a common ancestor.

2) Feudal societies (प्रवृत्तिय)

Societies organized around a system of lords and vassals.

3. Capitalist Societies :

Societies organized around the accumulation of capital and private ownership of the means of production.

4. Socialist Societies :

Societies organized around the collective ownership of the means of production.

D) Based on political structure:

1. Democratic Societies:

Societies with a system of government in which power is held by the people through elected representatives.

2. Authoritarian societies:-

Societies with a system of government in which power is held by a single individual or group without regard for the will of the people.

3. Totalitarian societies:-

Societies with a system of government in which the state exercises total control over all aspects of life.

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II Essential Elements of Society :-

1. plurality:

A society must have populations composed of all ages, sexes and groups of various economic statuses.

2. stability

A society is of a permanent character. Social life is organized mainly on the basis of division of labor.

3. likeness:

In society, the populations have some significantly alike in some ways. In earlier times, blood relationships was considered likeness to recognize the member of population or society, these days; it is recognized by nationality.

4. Differences:

A society must have differences in its population-interest, ages, sexes, opinions, intellectuality etc. so that the society is complete in it by itself.

5. Interdependences:-

Populations of a group that forms a society are often dependent on each other. When a child takes birth, its mothers must be taking care of it till it becomes able to feed itself. A member of a society must need operation for survival.

6. Cooperation :-

In human society, cooperation is a must, otherwise human society could have vanished along ago on the earth, simply because mankind are physically weaker, more frail in comparison to other powerful animals. population must have a feeling and behaviour of cooperation. A sense of confidence to get help from other population members.

Factors Causes of Social change :-

Social change refers to the transformation of social institutions, behaviors and attitudes over time. There are many factors that can contribute to social change, including:

1. Technological advancements :-

Advances in technology can lead to significant changes in the way people live and work, and can have a ripple effect on social institutions and cultural norms.

2. Economic factors :-

changes in economic systems, such as shifts from agricultural to industrial or service-based economies, can have significant impacts on social structures and behaviours.

3. Environmental factors :-

Environmental events such as natural disasters, climate change and resource scarcity can lead to social change as individual and communities adapt to new circumstances.

4. Demographic changes :-

changes in demographics, such as shifts in population size or composition, can lead to changes in social norms, values and institutions.

5. Political factors :-

changes in political systems, such as shifts in power from authoritarian to democratic regimes, can lead to changes in social institutions and norms.

6. Cultural factors :-

changes in culture; such as the spread of new ideas and values through media and technology, can have significant impacts on social norms and behaviours.

7. Globalization :

The increasing interconnectedness of the world through trade, travel, and communication can lead to social change as cultures and ideas are exchanged and integrated.

Classical Theories of Social Change:

classical theories of social change emerged in the 19th and early 20th centuries, as scholars sought to understand the complex social transformations that were taking place in their societies. Some of the key classical theories of social change include.

1. Evolution Theory:

Evolution theorists, such as Herbert Spencer, saw social change as a natural process of growth and development, similar to the evolution of species. They believed that societies evolved through stages of increasing complexity, with more advanced societies displacing less advanced ones.

2. Cyclical theory:

According to cyclical theorists, saw social change as a recurring cycle of growth, decay and renewal. They believed that societies went through cycles of expansion and contraction, with each cycle resulting in a new phase of growth and development.

3. Conflict Theory:

Conflict theorists, saw social change as the result of conflict between different social classes. They believed that social change occurred through the struggle for power and resources between the ruling class and the working class.

4. Functional Theory:

According to Functionalists, saw social change as the result of the need for societies to adapt to changing conditions. They believed that social institutions and structures served specific functions and that social change occurred as these functions changed over time.

Impact and Consequences of technology on socio-economic parameters:

1. Agriculture

Impact

precision agriculture allows for optimized crop yields and reduces waste through data-driven technologies such as GPS mapping, drones, sensors.

Consequence

- The use of chemical fertilizer and pesticides in agriculture can have negative environmental impacts, such as soil degradation and water pollution.

2. Communication

Impact

Digital communication allows for instant and easy sharing of information and collaboration across different locations and time zones.

Consequences

- The prevalence of digital communication can lead to social isolation and a decline in face to face interactions.

3. Construction methods

Impact

- 3D printing and modular construction techniques are increasing efficiency and reducing construction costs.

Consequence

- The adoption of new construction technologies can lead to job losses in traditional construction trades.

4. Information storage

Impact

- Digital storage allows for vast amounts of information to be stored and accessed easily, quickly and securely.

Consequence

- Digital storage can be vulnerable to hacking and data breaches, compromising sensitive information.

5. Information Generation:

Impact

- The use of artificial intelligence and machine learning technologies enables the generation of large amounts of data and insights that can inform decision-making.

Consequence

- The reliance on algorithms and automation for information generation can perpetuate biases and perpetuate misinformation.

6. Information dissemination :

Impact

- The internet and social media have revolutionized the way information is disseminated, making it easier and faster to reach a wider audience.

Consequence

Consequence

The ease of disseminating information can also lead to the spread of misinformation, propaganda, and fake news.

7. Dispute Resolution

Impact

- Technology can provide new and innovative ways to resolve disputes such as online mediation or arbitration, making dispute resolution faster and more accessible.

Consequence

- The use of technology in dispute resolution can raise concerns about impartiality, accountability and privacy.

8. Family Structure

Impact

- Technology allows for remote work, making it easier for families to balance work and personal responsibilities.

Consequence

- The increasing use of technology for remote work can lead to a blurring of boundaries between work and personal life, potentially affecting family dynamics.

9. Culture and Livelihood

Impact

- Technology can help preserve cultural heritage through digital archiving and preservation, and can enable new forms of cultural expression through digital media.

Consequence

- Technology can also contribute to loss of traditional livelihoods and cultural practices particularly in rural areas where access to technology is limited.

Effects of major technological developments:-

on practice of engineering profession:

1. 2D printing

- mass production of printed materials, such as books, newspapers, leading to increased literacy and access to information.

2. 3D printing:-

- customization and personalization of products, reducing waste and allowing for rapid prototyping and innovation.

3. Dynamite:-

- improved efficiency in mining, construction and demolition, but also lead to widespread use in warfare and environmental destruction.

4. Automation:-

- increased productivity and efficiency in manufacturing and other industries, but also led to concerns about job displacement and economic inequality.

5. Mechanization:

- increased productivity and efficiency in agriculture, industry and manufacturing, but also led to job displacement and concerns about worker safety.

6. Organic chemistry:-

- development of new materials, medicines and agricultural practices but also led to environmental pollution and health concerns.

7. Transportation:-

- improved mobility and accessibility, connecting people and goods across distance, but also led to increased energy consumption and environmental impact.

8. Internet:-

- global connectivity, access to information and services, e-commerce and social networking.

9. Communication:-

- instantaneous communication across distances, facilitating collaboration and innovation.

10. Satellite:-

- improved communication and connectivity across remote regions, enabling weather forecasting, remote sensing, and global positioning.

Key roles of Engineers in Society:-

Engineers play a crucial role in society as they design, build and maintain many of the systems and structures that we rely on everyday. Here are some of the key roles that engineers play in society.

1. Designing and building infrastructure:-

Engineers are responsible for designing and building infrastructure such as roads, bridges, buildings and water treatment plants. This infrastructure is essential for the functioning of society and its vital role to our quality of life.

2. Developing new technologies:

- Engineers are often at the forefront of developing new technologies that can revolutionize the way we live and work. They are involved in fields such as robotics, artificial intelligence, renewable energy and nanotechnology, among others.

3. Improving safety:

- Engineers play a critical role in ensuring the safety of society by designing and implementing safety measures of for buildings, vehicles and other structures. They work to prevent accidents and disasters and minimize their impact when they occur.

4. Protecting the environment:

- Engineers are increasingly focused on developing sustainable technologies and processes that can help protect the environment. They work on projects such as renewable energy systems, waste management and water conservation, among others.

5. Solving Complex Problems:

Engineers are problem solvers by nature and are often called upon to tackle some of the most complex challenges facing society. They use their expertise and creativity to develop innovative solutions to these problems.

Ethics and Professionalism

* Morals :

Morals measure the standard of good behaviour by which people are judged. Engineering morals mean the standard of good behaviour of engineering people by which they are judged.

- In moral quality, tightness or wrong are present.

Non-moral means devoid of moral quality.

- All actions are non objects of moral judgement. Only voluntary and rational people are the objects of moral judgements.

- The actions like nature or animals are not moral actions, even if the actions are good for human, because they are devoid of response of to human life. Therefore, it should be human behaviour concern for moral actions.

* Ethics :

- Ethics is a system of belief that supports the view of morality.

- Morality concerns with the principle of what is good and bad, right or wrong behaviour.

- Engineering morals measure the standard of good behaviour of engineers.

- As engineering people are the people to work for the benefits of mankind by exploiting the properties of matter and sources of power, they can come across moral-dilemma in various stage of works.

- The interest and will of the people in the society differ mainly because of seeking more benefits and return on behalf of them alone.
- They start then influencing the engineering people and then the conscience of engineer's come across moral dilemmas.
- The engineers need to overcome the dilemma considering various laws of ethics as described below.

a) External law

a) External law of ethics (3 slides)

- The external law of moral is the set of standards of goods behaviours based on the nature and scriptures. Studying the nature and scriptures, common sets of moral standards are set. The set of moral standards should be obvious to anyone who takes time to study the nature of scriptures. Everyone should act in accordance with the common set of standards. These law are general rules or principles. "Do onto others as you would have others do onto you" is an example.

b) Utilitarian law (3 slides)

- Utilitarianism is an ethical theory that focuses on maximizing overall happiness or utility for the greatest number of people. In the context of engineering ethics, utilitarian approach would involve considering the potential positive and negative

consequences of engineering decisions and actions and choosing the course of action that maximizes overall benefits and minimize harm.

c) Universalism law of Ethics: (3 slides)

Universalism is an ethical principle that emphasizes the importance of applying consistent ethical standards and rule universally, regardless of personal or cultural differences. In engineering ethics, universalism suggests that ethical principles and standards should apply uniformly to all individuals and communities, regardless of their background or circumstances.

d) Distributive Justice law of ethics (3 slides)

Distributive justice is concerned with the fair distribution of resources, opportunities and benefits within a society. In engineering ethics, this principle involves considering the equitable distribution of the benefits and burdens of engineering projects and ensuring that marginalized or disadvantaged groups are not disproportionately affected.

e) Personal liberty (state of being free from restriction) law of ethics

Personal liberty refers to the freedom and autonomy of individuals to make their own choices and decisions. In engineering ethics, personal liberty is often considered in terms of informed consent and respect.

for individuals rights to privacy, freedom of choice, and self determination. Engineers should prioritize the protection of personal liberty and autonomy while balancing it with the broader interests and well-being of society.

Ethics vs Moral:

1. Moral constitute a basic human marker of right conduct and behavior, the ethics is more like a set of guidelines that define accepted practices and behavior for a certain group of people.
2. Ethics relates to society or profession where morality is related to an individual person.
3. Ethics relates more in professional life while morals are what individuals follow independently.
4. "Morals are how you treat people you know. Ethics are how you treat people you don't know."
5. The morals are abstract, subjective and often personal or religion based, while ethics are more practical, conceived as shared principles promoting fairness in social and business interactions.
6. Moral values changes much more slowly than ethical values.

* Professionalism:

- A profession is defined as having systematic knowledge acquired through specified specialized training or education and practicing the same as an occupation. Besides these professionals have morals and ethical behaviors. The content of profession with morals and ethical behavior is professionalism.
- A professional helps in providing specialized work of service to the societies.

The following are the some of the features of profession:

- A professional acquires a systematic knowledge and enhance skill.
- A professional exercises the knowledge and enhance skill ethically as an expert, occupational or professional.
- The services or works as an expertise of a professional is evaluated by the public.
- professionals follow code of conducts to keep moral of the profession high.
- professionals have their own culture.

In society, some of the professions are found losing professionalism because of following cause.

- i) Inadequate salary
- ii) Defective social norms and value
- iii) Low moral of the individual
- iv) Non-regularities of law and regulations.
- v) Lack of political commitment.

The fundamental canons for the professional engineers are as follows:-

1. Engineers should hold paramount safety, health and welfare of the public in the performance of their professional duties.
2. Engineers shall perform services only in the areas of their competencies.
3. Engineers shall issue public statement only in the an objective and truthful manner.
4. Engineers shall act in professional matters for each employer or client as faithful agents or trustees and shall avoid conflicts of interest.
5. Engineers shall build their professional reputations on the merit of their services and shall not compete unfairly with others.
6. Engineers shall act in such manner as to uphold and enhance the honor, integrity and dignity of the profession.
7. Engineers shall continue their professional development throughout their careers and shall provide opportunities for the professional development of those engineers under their supervision.

* Moral Dilemma and Ethical Decision making:

- moral dilemma is the situation in which your soul choose the one of the equally unpleasant things.
- The crucial feature of a moral dilemma are: the agent is required to do each of two (or more) action, the agent can do each of the action but the agent cannot do both (or all) of the action.
- Ethical decision making helps people make different choices when faced with an ethical dilemma, a situation in which there is no clear right or wrong answer.

* Characteristics of Ethical Decision making:

Ethical decision-making involves a thoughtful and principled process for determine the right course of action when faced with ethical dilemmas. Here are some key characteristics of ethical decision making.

1. Rationality:

Ethical decision making is based on logical reasoning and critical thinking. It involves carefully considering the available information, analyzing the potential consequences and implications of different options, and evaluating the ethical principles and values at stake.

2. Consistency:

Ethical decision making aims for consistency and coherence in applying ethical principles. It involves applying ethical standards and norms consistently across different situations, avoiding contradictions or double standards.

- 3. Consideration of Consequences:-**
Ethical decision making involves weighing the potential consequences of different actions or choices. It considers the impact on various stakeholders, including individuals, communities, the environment, and future generations.
- 4. Ethical Frameworks:-**
Ethical decision making often involves utilizing established ethical frameworks or theories. These frameworks, such as utilitarianism, deontology, or virtue ethics, provide systematic approaches for evaluating ethical dilemmas and guiding decision-making based on underlying principles and values.
- 5. Inclusivity:**
Ethical decision-making considers the perspectives and interests of all relevant stakeholders. It takes into account diverse viewpoints, including those of different cultural, social and demographic groups, to ensure a fair and inclusive decision making process.
- 6. Ethical Awareness:-**
Ethical decision making requires a heightened awareness of ethical issues and challenges. It involves recognizing and anticipating ethical dilemmas, being sensitive to potential conflicts of interest, and proactively addressing ethical considerations throughout the decision-making process.
- 7. Reflective Practice:-**
Ethical decision-making involves self-reflection and introspection. It requires individuals to examine their own values, biases, and assumptions, and to engage in ongoing self-assessment and learning to enhance their ethical judgement and decision making abilities.
- 8. Transparency and Accountability:-**
Ethical decision-making encourages transparency in the decision-making process. It involves clearly communicating the rationale and justifications behind decisions and being accountable for the ethical implications of one's choices.
- 9. Continuous Improvement:**
Ethical decision-making is a dynamic process that evolves over time. It involves learning from past experiences, seeking feedback and continuously improving ethical decision making skills and practices.
- 10. Contextual Sensitivity:**
Ethical decision making recognizes the importance of context and the specific circumstances of each situation. It considers the cultural, legal and professional norms, obligations that may influence ethical judgements and actions.

* Liability: जागहीत / (डिफ़रा)

- Liability is a troublesome responsibility. It is a legal binding or an obligation.
- In engineering, engineers while performing their duties may create liabilities because of their doings.
- Engineers are active actors in the society to raise the life of people by creating facilities and services.
- When enough attentions towards all likely to be affected parties are not paid, liabilities are likely to occur. Liabilities occur because of negligence in performance.
- The liabilities that most engineers face are tort liabilities.
- There is an organization liability, which is understood as vicarious liability.

* Tort liability:-

- Sometime while performing engineering duties, engineers happen to harm or damage to other unconnected, non-related person or property.
- The engineers perform job more attentively towards their clients or organizations, but even doing so, they happen to cause damages or harms to those who are not related to the jobs at all.
- That happens due to unnecessary incidental negligence in doing jobs.
- Incidental negligence seeks compensation for the damages.

- That kind of negligence that harms unrelated person or property and seeks compensation is a tort liability.

* Crime liability:

- Crime liability refers to legal responsibility or accountability of an individual for their actions in committing a crime. It encompasses the principle that individuals who engage in criminal behaviour should be held responsible for their actions and face appropriate legal consequences.
- In most legal system, crime liability is determined based on a person's mental state, known as mens rea, and their physical actions known as actus reus. Both elements must typically be present for someone to be held criminally liable.

liability of Engineers in Project Design:-

1. Professional standards

Engineers are expected to adhere to professional standards and guidelines when designing projects. They are required to possess the necessary expertise, knowledge and skill to carry out their duties competently. Failure to meet these standards may result in liability if it leads to harm or damages.

2. Duty of care:

Engineers owe a duty of care to their clients, employers and other stakeholders who may be affected by the

project. This duty requires engineers to exercise reasonable care and skill in designing and planning projects to prevent foreseeable harm or risks.

3. Negligence:

If an engineer fails to meet the expected standard of care and their actions or omissions results in damages or injuries, they may be held liable for negligence. Negligence occurs when an engineer breaches their duty of care, causing harm that could have been reasonably foreseen and prevented.

4. Professional liability Insurance:-

Many engineers carry professional liability insurance, also known as errors and omissions insurance, to protect themselves against potential liability claims arising from their professional services. This insurance coverage can help cover legal process cost and damage associated with claims of professional negligence.

5. Contractual Obligations:-

Engineers often enter into contractual agreements with their clients or employers. These contracts typically outline the scope of work, responsibilities and any specific standards or performance requirements. Failure to fulfill these contractual

obligations may result in liability for breach of contract.

6. Regulatory Compliance:

Depending upon the nature of project, engineers may be subjected to specific regulations, codes and standards. Non-compliance with these legal and regulatory requirements can lead to liability if it results in harm or violation of applicable laws.

Liability of engineers in Project construction and Implementation :-

1. Supervision and Inspection:-

Engineers are often responsible for supervising and inspecting the construction and implementation of projects to ensure compliance with design specifications, codes and standards. They may be held liable if they fail to adequately oversee the construction process, leading to errors, defects, or safety hazards.

2. Quality Assurance:-

Engineers have a duty to ensure that the materials, equipment, and workmanship used in the construction and implementation of the project meet the required quality standards. If deficiencies or failures arise due to poor quality, engineers may be held liable.

3. Compliance with Regulations:-

Engineers are responsible for ensuring that the construction and implementation of the project comply with applicable laws, regulations, permits and building codes. Failure to adhere to these requirements can result in liability for non-compliance.

4 Coordination and Communication:

Engineers often collaborate with various stakeholders involved in the project, such as contractors, subcontractors and suppliers. They have a responsibility to effectively communicate and coordinate with these parties to ensure smooth project execution. Failure to properly manage these relationships and address issues can lead to liability.

5 Health and safety:-

Engineers have a duty to prioritize and promote health and safety throughout the construction and implementation process. They should identify and mitigate potential hazards, provide appropriate safety measures, and ensure compliance with occupational health and safety regulations. Negligence in fulfilling these responsibilities can result in liability if accidents or injuries occur.

6 Contractual obligations:-

Engineers may enter into contractual agreements with clients, contractors or other parties involved in the project.

These contracts define their roles, responsibilities, and performance requirements. Failure to meet contractual obligations can lead to liability for breach of contract.

II Loss of professionalism:

1 Loss of esteem:

A person with low self esteem finds excess to compromise professionalism easily.

2 Low moral of individual:-

Upbringing of a person holding license to practice a profession as defective or moral values and ethics of the profession, it results in low moral of the individual and loss of professionalism. If the values of fairness and personal integrity are not inculcated during childhood of a person, such person normally ends up having low moral.

3 Defective social norms and values:-

When a society accepts law or un-professional behavior, turns blood eye to unethically accumulated property respect persons with criminal records, admires, role breakers and mocks rule followers, professionalism decline.

4. Lack of political commitment:-

When national level political parties or government bodies are unwilling to take actions law breakers or unprofessional activities, the level of professionalism in the society normally plunges.

5. Weak or negligent professional societies:-

When professional societies like NEA, FCAN are weak or negligent in taking disciplinary actions its members who breaks its rules and guidelines, the members tends to neglect the code of conduct of such professional societies, resulting in loss of professionalism.

6. Inadequate salary:-

When the salary is inadequate to fulfill the basic necessities of life (food, clothing, kid's education, sanitation, health) and for when the salary level of similar trained person in a different profession is much higher, people tend to engage in unprofessional activities.

Ethical Issues in Professional Engineering in dealing with other professions:-

1. Accounting

When accountant expects approval of bill before work completed or before quality approved unnecessary variations order.

2. Banking:-

Over valuation, project progress, records, not evaluating parameters which may offer feasibility, not directing assumptions and associated risks.

3. Law:-

Disclosing/hiding clients informations lying under other telling particle truth with ill intent interfering in legal proceeding making comment all pending legal cases.

4. Journalism:-

Disclosing clients confidential information provide statement without proof data temptation to be on mass media, appearing an interview on topic which are out of expertise.

5. Management:-

Loyalty to management, whistle blowing, witness protection, leaking of confidential data to government for public goods, unfair treatment to subordinates.

Roles of Professional organization in Regulation and Professional Development

Regulation of the practice of engineering profession:
NEC and NEA regulates engineering professions by developing policies, plans, programs for smooth functioning of engineering profession and execute them.

1. Education and Accreditation
2. Licensure and Registration.
3. Code of Ethics.
4. Continuing professional Development
5. Disciplinary procedures
6. Public safety and welfare.
7. Scope of practice.

Objectives of NEC and Licensing Provision:

The objective of Nepal Engineering Council is to make the engineering profession effective by mobilizing it in a more systematic and scientific and also to register the engineers as per their qualifications. Its duties and responsibilities are:-

- To prepare policies, plans and programs for the smooth functioning of the engineering profession and to execute them.
- To set norms and standards for engineering education in Nepal.

- To grant permission and approval to carry out engineering education to those engineering colleges and institutions that meet the required norms and standards and to honor their degrees and certificates.
- To monitor and inspect the quality of engineering education provided by the engineering colleges and institutions.
- To fix the qualification necessary in order to practice engineering profession and to register their name in the council.

- To remove their name from the registration of the engineering council if found to violate the code of ethics.

= Licensing is one of the means of regulating the profession. The organizations providing engineering services, for example, are expected to obtain approval from professional organizations before starting their business, apart from fulfilling the required legal requirements. FCAN classifies its members into different categories/ classes like A, B, C and D, the contractors of each category are limited in the financial amount of work they can bid for.

- Licensing for individual engineers is provided by NEC, in the form of registration. As per clause 11 of NEC Act, "no person shall practice the engineering profession without getting his/her name registered in the council". Offenders are subject to fine to RS 3000 or jail up to three months or both.

Licensing exam has been started from the amendment of NEC provision from 2079 BS.

Two of the objectives of NEC are related to the licensing of engineering professionals are:

To fix qualification necessary in order to practice engineering profession and to register their name in the council.

To remove their name from the registration of the engineering council if found to violate the code of ethics.

* Objectives of NEA:-

To promote development of the engineering science and technology in Nepal.

To promote fellowship goodwill and cooperation assistance among the Nepalese engineers and safeguard their rights and interests.

By utilizing, to the highest extent possible, the participation of the national engineering manpower of the country in the national development activities of Nepal, make effort towards ending foreign dependency in this regard.

To continuously enhance the highest professional ideals among the members and widen it.

To develop relations, fellowship and goodwill with international engineering associations and institutions.

X Difference between NEC and NEA

NEC

1. Statutory body, established under NEC Act, in 1999
2. Must register before practicing engineering profession
3. Executive body by election and nomination
4. Evaluates and approves establishment of academic institutes offering engineering programs.
5. Offers different categories of engineering profession: general, professional and foreign.
6. Monitors academic institutes offering engineering program (every year for temporary approval and every two years for permanent approval) and cancels approval if found not up to standard.
7. The directives and code of conduct issued are mandatory

NEA

1. An NGO, established in 1962
2. Registration / membership is voluntary.
3. Executive body by election
4. No such provision
5. No such provision
6. No such provision
7. The directives and code of conduct issued are voluntary,

X Fundamental principles of Professional Engineering Ethics:

The engineers, to uphold and advance the honor and dignity of the engineering profession and in keeping with high standards of ethical conduct.

1. Will be honest and fair, and will serve with devotion his Employer, his clients and the public.
2. Will dedicate himself to the advancement of competence of engineering profession and to the dissemination of engineering knowledge and
3. Will use his knowledge and skill in the service of humanity.

Code of Ethics and guidelines for professional engineering practice - the NEC Code of conduct:-

The professional code of conduct to be followed by the registered Engineers of the council, subject to the provision of the Nepal Engineering Council Act 2055 and the Nepal Engineering Council Regulation, 2057 has been published as follows.

i) Discipline and Honesty:-

The engineering services profession must be conducted in a disciplined manner with honesty, not contravening professional dignity and well-being.

(iii) Politeness and Confidentiality:-

Engineering services for customers should be seat with in a polite manner and professional information should remain confidential except with written or verbal consent of the customer's concerned. This however, is not deemed to be a restriction to provide such information to the concerned authority as per the existing laws.

(ii) Non-discrimination :

No discrimination should be made against customer on the grounds of religion, sex, caste or any others things while applying professional knowledge and skills.

iv) Professional work:-

Individuals should only do professional work in their field or provide recommendation or suggestions only within the area of there study or obtained knowledge or skills. With regards to the works not falling with-in the subject of one's profession, such as works should be recommended to be done by an experts of the subject matter.

v) Deeds which may cause harm to the engineering profession

With the exception of salary, allowance, and benefits to be received for service provided, one shall not obtain improper financial gain of any kind of conduct improper activities of any kinds, which would impair the engineering profession.

vi) personal responsibility

All individuals will be personally responsible for all works performed in connection with his/her engineering profession.

vii) State name, designation and registration number:-

While signing the documents or descriptions such as the design, map, specification and estimates etc. relating to the Engineering profession, the details should include the name, designation and NEC registration No and should be stated in a clear and comprehensive manner.

viii) No publicity or advertisement must be made which cause unnecessary effects:-

In connection with the professional activities to be carried out, no publicity or advertisement shall be made so as to cause unnecessary effects upon the customers.

Roles of professional organization in induction of new entrants into the profession:-

Another major role of the professional associations is to guide new entrants into the profession by

- providing orientation and training.

- guiding on the conventions of the profession.

- providing information on the ~~does~~ and don'ts of the profession.

potential pitfalls when the code of conduct are not followed.

- linking the new comers with establishment members of profession.

Crucial on general job description and employer's expectation from new recruits.

- Training new entrants for job seekers, proposal writing, bidding, project terms and conditions negotiation etc.

Upgrading and maintaining the professional and technical competence of members of professional association:

Professional societies take various steps for upgrading and maintaining the professional and technical competence of its members by

- organizing regular professional development courses and continuing education programs, like running

- Engineering staff college.

- organizing skill development oriented training programs.

- organizing regular talk programs to share experiences and lessons learned from different projects.

- providing platform for its member to expose their works by organizing national conference.

- Publishing technical journals and news bulletin.

- Organizing exposure field visits to different projects.
- providing exposure to national and international experiences by organizing national and international visits to its members.
- Proactively working with academic institutes, on development and update of university curriculums.
- Proactively working with research institutes for involving its members in research and development activities.
- Proactively working with service providing organizations (consulting companies, contractors, material suppliers, software developers, equipment operators) to establish link of its member with established organizations.

Ensuring Occupational health, safety and general welfare of the public :-

- The professional engineering associations are expected to play the role of monitors of quality of works of its members, including the matter of safety and general welfare of the public.
- When a particular member is found to violate the codes of conduct, compromise on quality of works, and neglect public safety and public welfare, the concerned professional engineering association can warn them, and reprimand/cancel their membership.
- NEC is planning to introduce a system of Accountability Accountability in Engineering professional services.

The standard design manuals, design procedures, building codes, including professional judgement will be evaluated as a part of safety and general welfare of public in engineering works.

NEC / NEA / SCAET / FCHAN etc can monitor provision of occupational health, safety and general welfare of workers and general public in specific projects.

Roles of Professional Societies in Environment protection:
Professional societies can play a significant role in advocating for and promoting environmental protection. Some of the various roles of professional societies in this area may include.

1. Setting Standards:-

Professional societies can develop and promote standards of environmental sustainability that their members should adhere to in their work. These standards can encourage environmentally responsible practices in various industries.

2. Advocacy:-

Professional societies can advocate for environmental issues at the local, national and international levels. They can work to influence policy and regulations to promote environmental protection and sustainability.

3. Education and training:-

Professional societies can provide education and training for their members on environmental issues and best practices. This can help ensure that professionals are equipped to minimize the environmental impact of their work.

4. Collaboration and networking:-

Professional societies can facilitate collaboration and networking among their members to share best practices and ideas for environmental sustainability.

5. Research and development:-

Professional societies can fund research and development of new technologies and innovations to promote environmental sustainability and mitigate the impact of climate change.

Note: NEA = Nepal Engineers Association

NEC = Nepal Engineering Council

SCAEF = Society of Consulting Architectural & Engineering Firms.

FCAN = Federation of Contractors Associations of Nepal

Providing technical expertise to public authorities in developing policies, acts, standards, project implementation procedures and international agreements and negotiations:-

The local government organizations frequently seek technical expertise from professional associations in the development, drafting and amendment to the existing acts, rules, regulations, policies, guidelines, bylaws, provisions, plans and programs. NEC, NEA, SCAEF, FCAN and other professional organizations provide technical expertise to different government organizations, including legislators, etc and when requested. When those professional associations do not have in-house expertise, they coordinate with individual (or institutional) members to provide such services.

NEA and DPNet independently conducted study of Jure landslide (Sankoshi) in 2014 and submitted expert advice to deal with the disaster.

9 Legal Aspect of professional Engineering in Nepal

// Introduction to Nepalese legal system:-

Components of legal system:-

The legal system of a nation includes:

1. Acts/laws, court decisions/precedents (ain, kanun, nisnaya/najis)
2. Rules, regulations, bylaws, directives (niyam, biniyam, nradesika)
3. Treaties, conventions, policies (sandhi, prachalan, niti)
4. Formation orders, ordinance, promulgations, (adesha, adhyadesha, ghoshana)
5. access to justice, freedom to choose legal advisor.
6. Concepts of "innocent until proven guilty"; "equal under law" and
7. Implementation aspects, including consistency, of 1 to 6 above.

Nepalese legal system:-

- In Nepalese legal system, a person is practically "presumed guilty until proven innocent". As soon as a person, or an officer, is charged of a crime, he/she is losses his/her official privileges, expected to resign from his/her post or automatically suspended till the case is "closed" by a court of law.
- The Nepalese society normally presumes a person guilty as soon as she/he is charged of a crime.

people have very low level of faith on the importance of justice/legal system. many persons found guilty by a court, but with good connection, roam in government offices, while persons with low access to resources waits for years, even decades, for court verdict on cases he/she files.

Act related to Engineering professional practice in Nepal:-

- The patent, Design and Trademark Act, 1965
- Labor Act, 1992
- Insurance Act, 1992
- Immigration Act, 1992
- Foreign investment and Technology Transfer Act, 1992
- Industrial Enterprises development institute Act, 1996
- Value added Tax (VAT) Act, 1967
- Environmental protection Act, 1967
- Contract Act, 1999
- Nepal Engineering Council Act, 1999
- Nepal Arbitration Act 1999
- Local self Governance Act, 1999
- Construction Business Act, 1999
- Copy Right Act, 2002
- Income Tax Act, 2002 & Regulation
- Company Act, 2006
- mediation Act, 2011
- Public procurement Act, 2007 (Amendment 2012)
- International laws/conventions, Bilateral agreement (WTO:- 23 April 2004, ILO, BIOPA)

Contract:

Contract Act (2056 or 1999) has defined the term contract as an agreement made between two or more than two parties to do or not to do any business, which can be enforceable as per law. Contract & fulfilling legal requirements and having legal status are valid contract.

Essentials of valid Contract:-

a) Offer and acceptance:

An offer is a promise made by a party/person to another party/person with an intention of getting approval over his/her promise. A tender submitted by a contractor is considered as offer. The client, after due consideration and evaluation of the offer, provides acceptance of the offer.

b) Mutual intent to enter into contract:-

An agreement between two (or more) parties is not automatically a contract. A contract requires the parties' intention to establish a legal relationship. The parties' intention of entering into contract should be clearly reflected in the agreement.

c) Consideration:

All the concerned parties of the contract should get something of value for fulfilling the terms and conditions of contract.

d) Capacity of contract:-

A party (or person) entering into a contract should be of legal age and should be under his/her own control.

e) Lawful purpose:

The objective of a contract must be lawful to be valid.

f) Free consent:-

The parties in a contract should have consented freely to enter into the contract. A contract signed under coercion, undue influence, fraud, misrepresentation etc. are invalid.

Void and voidable Contracts:

Void contracts:

The contract is considered as void contract.

a) if the contract is against the existing law and public welfare.

b) if the subject matter of a contract is unclear to give meaning, and

c) if the contract is found not possible to perform from the time of entering into contract.

- Preventing anyone from engaging in any legal occupation, profession or trade.

- preventing any one from enjoying public facilities.

- Seeking to prevent the legal rights of any person from being enforced by any government office or court.

- Concluded in matters, contrary to / prohibited by prevailing laws.
- Concluded for immoral purpose / against public morality or public interest.
- Which cannot be performed because the parties there to do not exactly know about the matter in relation to which it has been concluded.
- Which is considered impossible to fulfill even at the time, the contract is concluded.
- Which is vague (does not provide reasonable meaning thereof)
- Concluded by an incompetent person.
- Concluded with an unlawful consideration or objective.

Voidable Contracts :

→ A contract concluded through

a) Coercion

threatens to withhold property, threatens defamation, takes actions against law.

b) undue influence

influence exercised by a person upon another who is under his/her influence, like a ward/subordinate/sick.

c) fraud:

knowingly leads the other party to believe untrue issue to be true, withholds or suppresses information.

d) deceit: submission of false particulars, falsifying document.

→ The burden of proof rests on the claimant.

Significance of Contract:

- makes agreement legally enforceable.
- Records the terms of agreement (TOR, scope of works)
- Specifies the roles and responsibilities of each party of the contract.
- Specifies the corrective measures in case of breach of contract.
- Specifies quantity & quality of work, work schedule and payment schedule & mode.
- Identifies parties of the agreement and the official agents/representatives of the parties, if any.
- Sets out in advance the course of action to be taken in different foreseeable situations.
- Defines words and establish common language.
- Defines limitations of the contract.
- Defines ≠ contract termination procedure.
- Defines responsibilities of the contracting parties to the third parties like government, community, workers, sub-contractors, material supplier, labor, unions etc.

Factor to be considered in preparing an contract document:

- The contract must be fair to all the parties entering into the contract.
- The language used in the contract must be clear (unambiguous)
- The contract language must be consistent - same word, phrase or abbreviation should not have different meaning in different locations; like NEA and NCA, PPA and PPA, and Bus and Bus.

→ There should be no repetitions, as it tends to create confusion.

→ Contract information must be retrievable by all the parties entering into contract, whenever they need it. So multiple original copies of the contract should be prepared.

→ The terms of the contract should not conflict with existing laws.

→ All legal provisions to make the contract valid and enforceable should be compiled, like witness, immediate stakeholder (in case of land/ property ownership transfer).

Interpretation of contractual clauses:-

→ If the language in the contract is clear, the words and terms are interpreted on the basis of the intention of the parties, which is reflected in the contract.

→ If the words and terms are not used to give special (or technical) meaning, the words and terms are explained or understood in their ordinary meaning.

→ If words or terms are ambiguous or vague or used to give special (or technical) meaning, then outside help is taken in the interpretation of the words.

→ If the contract is ambiguous, with double meaning, or contains conflicting provisions, such words, terms or contractual clauses are interpreted in favor of the party who has not drafted the contract. This rule of interpretation is called *contra proferentem* rule. (against the offerer.)

Conditions for establishment of professional negligence:

Duty:-

Unless there is a contractual duty to perform a work there is no negligence in the performance of the work.

Breach:-

Unless there is a breach of the terms and conditions of an agreement, professional negligence cannot be proved.

Damages:-

Unless there is a specific damage to the claimant, professional negligence cannot be established.

Proximate cause:-

There should be direct (one to one) relation between the specific action of a professional and the loss resulted by the action to the claimant.

Liability under Contract:

→ There is a contractual relationship between the auditor and his client. When carrying out his duties, the consultant should exercise reasonable care and skill.

→ The degree of skill and care required will depend principally on the nature of work undertaken.

→ The fundamental principles requires that the auditor carries out his professional work with skill, care, diligence, and expedition and with proper regard for the technical and professional standards expected of him as member of profession.

* Criminal law and Tort

Criminal law	Tort
- Committed against the public	- Committed against a particular good.
- Follows criminal trial procedure.	- Considered a civil or private wrong.
- Purpose of Criminal law is to protect society by punishing criminal offenders.	- purpose of tort law is to compensate a victim for injuries suffered.

Duties and liabilities of designers & professionals:

- Fit for purpose (design proper project)
- Negligence/mistakes in designing.
- Statutes, bylaws and building regulation/code.
- Examination of ground above and below the site.
- Public & private rights.
- Plans, drawings & specifications.
- Materials (quantity, quality, availability).
- Risky design and employer's interference in design.
- Revision of design during construction.

Types of business Enterprises:-

- A. Sole Business Concern
 - Registered under Private Firm Regulation Act 2014.
 - Sole ownership, management and control: A single person establishes, owns, manages and controls all aspects of the business.
 - No separate existence of business and owner.
 - Unlimited liability: owner liable to pay from business property as well as personal property, if needed.
 - Ownership and risk: sole risk and owns total profit.
 - Individual capital investment.
 - Freedom of occupation.
 - Limited area of operation.
 - less legal formalities.
 - Voluntary origin and end: owner can start and end business by fulfilling certain legal formalities.

Advantage

- Easy to form or establish.
- Effective management and control.
- Easy to dissolve, High flexibility, quick decision.
- Sole claim on profit.
- Secrecy.
- Benefit of inherited goodwill/credit standing.
- Direct relationship with customer, social and national advantage, stability and continuity.

Disadvantage

- unlimited liability
- limited management
- chance of wrong decisions, lack of specialization
- loss in the absence of a key person.
- uncertain future.

- limited capital
- limited expansion.

B. Partnership Business Organization

- Registered under the partnership Act: 2020 BS (1964)
- plurality or association of persons.
- Joint ownership
- Unlimited liability
- sharing and profit and loss
- Established on the basis of agreements and between the persons.
- members do not have separate existence.
- Joint management and control
- Joint agency
- Partnership right cannot be transferred / No transfer of interest.

Advantage :

- Easy to form i.e register.
- Capital and credit
- Advantage of division of labor.
- Integration of Ability & skill
- Quick decision making
- Incentive to work hard.
- Flexible (to change mode of business)
- Possibility of expansion.

Disadvantages

- Unlimited liability
- Uncertain existence
- limited resource compared to company.
- possibility of misunderstanding among partners.

c) Limited Company (Joint stock Company):

- Established under the act of the country and has limited liability.
- Finance is collected through issuance of shares.
- A company is considered as an artificial legal person.
- Company Act 2053 regulates the incorporation of a company in Nepal.
- Further divided into
 - Private limited company
 - Public limited company
- As per Company Act 2053, private limited company shall have up to 501 shareholders and public limited company shall have a minimum of 7 share holders.
- Maximum 11 members in Executive Board in private limited company.
- A public company's paid up capital must be at least NRS 10 million.
- characteristics:-
- Voluntary association of persons.
- legal artificial person: It can purchase and sale properties in its own name.

perpetual existence: Actions one are shareholders does not affect its continuity.

Limited liability

common seal: use specific seal for all official business.

capital collected by distributing shares.

Transferability of shares.

management of representatives.

publication of financial statements.

Advantage

- limited liability
- perpetual existence
- Unlimited Capital
- Unlimited business capability.
- Transfer of shares
- Effective management
- Public faith.

Disadvantages:

- Difficulty in formation, lengthy legal and formal process.
- Lack of personal interest
- Lack of secrecy
- possibility of fraud.
- Exploitation of share holders.
- Groupism for power (office politics)
- (conflict of interest).
- Absence of prompt decision.
- Lack of closeness.

Intellectual property Right :

The creations of human mind are considered as intellectual property. It covers patents, designs, trademarks and copy right; the legal rights given to the creators of such properties are called intellectual property rights. The word intellectual property organization has listed the following as intellectual property.

- Literacy, artistic and scientific works.
- performances of performing artists, phonograms, and broadcasts.
- Inventions in all fields of human endeavor.
- Scientific discoveries.
- Industrial designs.
- Trademarks, service marks, and commercial names and designations.
- protection against unfair competition and
- All other rights resulting from intellectual activities in industrial, scientific, literary or artistic fields.

The laws related to intellectual property rights in Nepal are

- a) patent, Design and Trademark Act 2022 (1965), amended in 1987 and [PDT Act]
- b) Copyright Act 2059 (2002)

* Copy Rights:

As per the copy Right Act 2059, the copy right can be provided to the author of the works that are related to the following.

- Book, pamphlet, article and research paper.
- Drama, opera, dumb-show and similar works prepared for show.
- Musical works with or without words.
- Audiovisual works.
- Architectural design.
- Painting, sculpture, wood carving, lithography and architecture related other works.
- Photographic works.
- Works related to applied art.
- Except, maps, plan, tree, dimensional works related to geography, topography, and scientific writing and articles.
- Computer program.
- The description or the explanations of the ideas, religion, news, concept, formula, law, court decisions administrative decisions, folk songs, folk stories, proverbs & general statistics, even if they are included in any works, cannot be copy righted.
- Specific registration is not required to have copy right.

- There are two types of right granted under the Copy Right Act: Economic and moral. Moreover, the Act has granted rights to performers, producers of phonograms and to broadcasting institutions. The copy right is effective up to 50 years after the death of the author (or creator) of the copy righted materials.

The copy righted materials can be used without permission in the following circumstances:-

- a) A portion of the work for personal use, as long as it does not hamper the economic right of the copy right holder.
- b) For public cause or academic purpose, portion of a published materials may be used with proper citation of the source, provided that the use does not directly benefit (economically) the user of the copy righted materials.
- c) Libraries and archives can reproduce the works for general purpose.
- d) Depending upon the degree of infringement of the copy righted materials, the penalty can range from 10,000 to 100,000 or imprisonment up to six months or both for the first offense. The penalty doubles for the second offense. Besides, the offender shall be liable for compensation of the damages caused by his/her act.

* Patents:

- As per the PDT Act 2022, the patent can be issued to any useful invention based on new principle or formula, or any new way or method of construction, operation or transmission related to substance or a body of substance.
- A patent should be duly registered, by submitting all the required documents, to have the patent right. Once registered, the right over the patent is protected for 7 years (plus two extensions, each of 7 years). The patent right is transferable. The registered patent should not be used for or copied without obtaining specific written permission from the patent holder, until the patent duration expires, within the jurisdiction of the patent provider. The law breaker can be fined up to RS 5,00,000 and confiscation of the related items, and up to RS 25000 for committing an attempt of an offence.

A patent right cannot be granted if

- The patent is already registered in another person's name.
- The patent was not invented by the applicant and the right to patent has also not been received from the inventor.
- The patent is likely to produce adverse effects on health, conduct and morality of citizen or on national interest.
- The patent is against the existing law.

* Design:

- The PDT Act 2022 has defined design as a feature, pattern or shape of a substance made by following any means.
- The design should be registered to have design right. A registered design should be used by someone else only with specific written permission of the design right owner, until the design right duration expires (5 years plus two extensions, each of 5 years).
- The breach of the design right constitutes a fine of upto RS 50000 and classification of the related items.

The design right cannot be issued if:

- a) the design was already registered by someone else, and
- b) the design is likely to have adverse impact on the conduct or morality of a person or institution or on national interest.
- c) The patent is against the existing law.

5 Conflict and Dispute Management

X Trademark:

The PCT Act 2022 has defined trademark as the use of any word, sign or picture or a combination of them by a firm, company or person to distinguish the product or services from those of others.

The trademark should be registered to have trademark right. A registered trademark, or its close imitation, should not be used by someone else. The right over a trademark can be protected forever subject to renewal (7 years in each renewal).

The trademark will be registered if.

- the trademark has already been registered by someone else and
- the registration will have adverse impact on the conduct or morality of a person or institution or on national interest

The breach of trademark right constitutes a fine of upto RS. 100,000 and confiscation of the related items.

Conflict:-

Conflict results when people have different (real or perceived) value or approach on particular issues. "Organizational conflict is a state of discord caused by the actual or perceived opposition of needs, values and interests between people working together."

Three approaches to organizational conflict

a) Traditional approach (1930-40):

Conflict is opposite of cooperation, and is inherently bad, negative and harmful for smooth functioning and progress of society, organization or a project. Conflict is equated to dysfunction and destructive, must be avoided. It results from poor communication, disagreement, lack of trust, and low management skill.

b) Human Relations approach (1950-70):

Conflict is inevitable and can be beneficial, if managed properly. It is not inherently bad.

c) Interactionist approach:-

Conflict makes an organization dynamic, and helps in finding best solution to problems. On-going manageable level of conflict should be encouraged as it prevents organization from being static. So conflict is good.

* Levels of conflict:-

1. Intrapersonal conflict:-

Conflict with self due to differences in goal, role and personal values.

2. Interpersonal conflict:-

between two or more persons, can be due to differences in goal, role, values, culture, communication gap.

3. Intergroup conflict:-

between two or more groups of people.

4. Inter-organizational conflict:-

between two or more organizations.

5. International conflict:-

between two or more nations.

* Sources of Conflict:-

a) Personal differences / personality clash:-

When the ideas, values, culture and customs of a person (or persons) are incompatible with other persons of an organization.

b) Goal and role incompatibility:-

When the ideas, values, culture and customs of a person (persons) are incompatible with the goal of an organization or assigned role of the person in the organization.

c) Organizational climate and change:-

When the work environment and rules of an organization are unpredictable, and when the rules or managers or owners of the organization suddenly changes.

d) Gender and other social differences:-

When the work environment and rules are designed to favor employees from a particular socio-cultural background or particular gender.

e) Availability and access to resources:-

When the availability of resources becomes too limited and/or unevenly distributed. When access to resources is uneven.

f) Communication gap:-

When there is communication gap between organization and its employees.

Conflict Resolution method:-

1. Avoidance :-

Avoid conflict, ignore conflict, "time will heal" approach
in this method the management will try to create a situation where conflict does not occur, for example by hiring workers from similar socio-cultural background.
If conflict occurs, the management will wait for the situation to calm down, rather than taking any proactive situation.

2. Diffusion :-

Distraction and defuse into multiple sectors; bring in "other" issues so that main reason from the conflict becomes less important or one of the many issues; bring in other stakeholders.

3. Containment :-

Conflict contained within certain people, and resolved through discussion and ~~bargaining~~ bargaining, in closed meetings, in the hope to resolving the conflict before it goes out of control or before it expands.

4. Confrontation :-

Conflict brought in front of all concerned, conflict resolution through open dialogue, face to face meeting, open bargaining, and resorting to legal process, if needed.

5. Conciliation

mutually agreed terms and conditions, "give and take" approach, without direct involvement of outsiders (mediators), even though the mediator assists in bringing the parties together.

6. mediation :-

Similar to conciliation, but with direct involvement of outsiders (mediators). The mediator facilitates, and intervenes, if needed, in conflict resolution process (as per mediation Act 2008)

7. Arbitration :

Resolution through certified licensed professional arbitrators, using the clauses of acts and regulations, after thoroughly investigating the issues of conflict. The arbitrators are normally selected, by mutual consent, from panel of experts.

8. Litigation :

Resolution through court, as per prevailing laws, acts, rules, regulations, and legal precedents of a country.

Dispute:-

- Disputes are even inevitable in construction projects and in engineering professional works.
- Dispute resolution procedures are normally mentioned in the conditions of contract.
- The public procurement Act 2063 (PPA 2063, chapter 7, clause 58) and public procurement Rules 2064 (PPR 2064, chapter 12) have provisions for dispute resolution.

If the parties in dispute cannot resolve the dispute through mutual consensus (amicable settlement), then as per clause 129 of PPR 2064.

- For works of value up to RS 100 million; disputes can be settled by sole adjudicator (neutralist)
- For works of value above RS 100 million, disputes shall be settled by a Dispute Resolution Board (DRB) consisting of three members (one from private party, one from public entity and one agreeable to both, clause 130-2)

If the parties can not settle dispute through adjudicator or DRB, then the dispute can be resolved through arbitration (~~neutralist~~) or litigation (court).

- The adjudicator is a related technical expert with at least 5 years of experience.
- Remuneration of the adjudicator will be borne equally by the private party and public entity.

Dispute Resolution method

1. Adjudication:-

→ The adjudication is "a quick and relatively inexpensive way of resolving a dispute, whereby an impartial third party adjudicator decides the issues between the parties!"

→ The following are the characteristics of adjudication

- It is a mechanism of dispute resolution.
- An independent third party, called adjudicator, awards the decision.

• Quicker and inexpensive mechanism of dispute resolution, compared to arbitration and litigation, normally taking less than 30 days after submission of all relevant documents.

→ The public works Directive (PWD) (PWD) and Public Procurement Act (PPA, 2063, clause 58) have provisions for dispute resolution through adjudication.

2. Arbitration:-

- The arbitration is a formal mechanism of dispute resolution conducted outside a court, as per Arbitration Act 1999. The following are the advantages of arbitration over litigation.

• It is a private alternative to formal court procedure: voluntary in nature.

- The arbitrators are technical experts; can result in creative solutions.
 - Faster conclusion, within 120 days after submission of documents (clause 24)
 - Less expensive
 - No public hearing, so low publicity and less stress (which is normally preferred by the parties)
 - Less confrontational and formal, hence no more convenient to the parties of dispute can appeal against decision in Appellate Court within 15 days (clause 21-2)
- The PPA 2063 has recognized arbitration as a means of dispute resolution. Arbitration Act 1999 (clause 17) governs the arbitration procedure in Nepal. The Nepal Arbitration Council #1991 has been providing arbitration services in Nepal. However, in Nepal, most of the disputes go to court, or settle settled out of court through mutual consent, even after arbitration, by ignoring the arbitrator's decisions.

Conflict vs Dispute

Conflict

- Long term serious disagreement, non specific issues.
- Non-negotiable issues.
- Involves principle, values, ego, belief, interest.

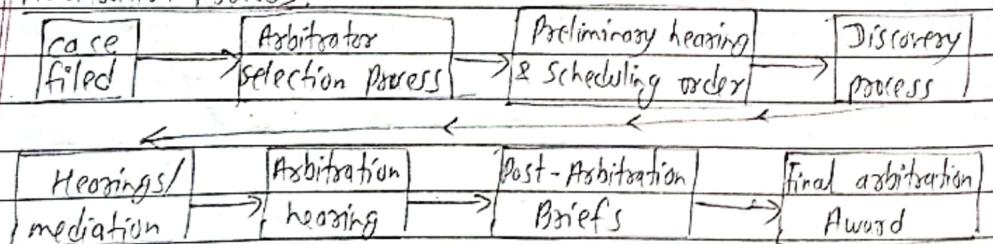
Conflict does not turn into dispute, unless intervened.

- Each side is fundamentally opposed to the success of the other and will not compromise or policy in which a claim or their own values at the risk of allowing those they despise to achieve even the slightest victory (Burstyn, 1990)

Dispute

- Short term disagreement, over specific issues, can be resolved.
- Negotiable issues.
- Involves amount, money.
- Disputes, if unsettled, can convert into conflict.
- Specific disagreement concerning a matter of fact, law or policy in which a claim or assertion of one party is met with refusal, counter-claim or denial by another; win-win scenario can be compromised.

Arbitration Process:



Case study Related to Practice of Engineering Profession

Cases involving public safety, industrialization and protection of environment.

Q1 During quality control monitoring visit for an emergency relief camp building in a remote village, you noticed that the building is being constructed on the bank of a river and it will be inundated during flood. Approximately 25% of the construction was completed. The site was selected by your friend with the consent of the local people. The quality of construction materials and method was as per the specification. Your job is to ensure the quality of building. Discuss the care and recommended your views on whether to recommend continuation of the construction.

Solution:

In this case, as a quality control officer responsible for ensuring the quality of the building, it is important to carefully evaluate the situation and make an informed decision regarding the continuation of the construction.

a) Assess the Risk:

The first step is to assess the risk associated with the construction site being located on the bank of a river. Consider factors such as the history of flooding

in the area, the intensity and frequency of floods and the potential impact on the safety and functionality of the relief camp during floods.

b) Consult with Experts:

Seek advice from hydrologists, civil engineers and local authorities who have knowledge about the sites and the potential risks. Their expertise will help in understanding the long term implications of building in such a location.

c) Analyze Alternatives

Explore alternative sites that are safe from floods in the vicinity. Consider the feasibility, accessibility and acceptance of alternative sites by the local community. This analysis will help determine if there are viable options available.

d) Consider Community Preferences:

If the local community has consented to the construction on the current site, it is important to engage with them and understand reasons for choosing that location. It is possible that they have other factors in mind, such as proximity to essential services or cultural considerations. Their input should be taken into account.

e) Evaluate Cost-Benefit:

Assess the cost of abandoning the current construction site and relocating to a safer location, considering the progress made so far (25% completion) and the potential financial, and logistical implications. Compare it with the benefits of ensuring the safety and durability of the relief camp in the long run.

Based on these considerations, the following recommendations can be made.

- If the risk assessment indicates that the site is highly vulnerable to floods and poses a significant threat to the safety and functionality of the relief camp, it is advisable to discontinue the construction and explore alternative locations.
- If feasible alternatives sites are available nearby and have the support of local community, it is recommended to shift the construction to a safer location to avoid the risks associated with flooding.
- If there are no viable alternatives sites or if the local community strongly prefers the current location despite the risks, additional measures should be implemented to mitigate the flood risk. This may include the raising of foundation, implementing flood-resistant construction techniques, or incorporating early warning systems.

Q3 A client came to a designer and asked to design a multistoried building. The soil type of the proposed site was found not suitable for that type of structure. The designer hesitated to design the building. The client said that he actually was not going to build that structure. He wanted to collect money from outside sources showing the designed as a proposal for his venture and wanted to utilize that money in ~~other~~ attractive business. Explain the roles of the client and the designer in the perspective of professional ethics.

Cases involving conflict of interest / personal integrity, personal privacy

→ Solution,

In the given scenario, the roles of client and the designer raise ethical concerns related to professional integrity and responsibility.

a) Client's Role :-

The client's intention to mislead outside sources and collect money under false pretenses is unethical and potentially fraudulent. Misrepresenting a design model proposal to secure funds for personal gain in a different business venture violates the principles of honesty, transparency, and integrity. It can harm the reputation of the client, damage relationships with stakeholders, and potentially have legal consequences.

b) Designer's Role :-

As a professional designer, the designer has responsibility to uphold ethical standards and prioritize the well-being and safety of the public. In this case, the designer hesitates to design the building due to unsuitability of the soil type. This hesitation demonstrates the designer's commitment to professional ethics, as designing a structure on unsuitable soil can compromise the safety and structural integrity of the building. By refusing to design the building, the designer is acting responsibly and ethically.

Professional Ethics Considerations:

a) Honesty and integrity

Both the client and the designer have an obligation to act with honesty and integrity within their professional dealings. Misleading others for personal gain violates these principles and undermines trust in the profession.

b) Client's intentions:

The client's intentions to deceive and misuse funds undermines the integrity of the design process. It is important for the designer to be aware of such intentions and not become complicit in unethical practices.

c) Public safety:

Design professionals have a duty to prioritize public safety and welfare. The designer's hesitation in designing a building on unsuitable soil reflects their commitment to ethical practices, as it would be unethical to knowingly design a structure that may pose risks to occupants.

d) Professional Responsibility:

Designers have a responsibility to exercise professional judgement and make decisions based on their expertise and knowledge. This includes refusing projects or design proposals that could compromise ethical principles, such as safety, environmental impact or misrepresentation.

In this situation, the designer should maintain professional integrity by refusing to participate in the client's unethical plan. It would be appropriate for the designer to express concerns about the client's intentions, communicate the unsuitability of the site and seek alternative solutions that align with ethical standards and prioritize public safety.

Cases involving professional negligence (duty, breach, proximate cause and damage)

Q3 A number of cracks, structural as well as settlement appeared in a building designed by an engineer, within two years of its completion. municipality had approved the design and drawing. later it is found that without any soil investigation, structural design & detailing of reinforcement report had been prepared during the construction of the building.

- Discuss the position of the building owner.
- The engineer's role.
- The role of the municipality
- Who is ultimately responsible for the damage?

Cases involving breach of duty, criminal law and tort.

Q1 Read the case carefully and explain clearly, taking adequate reference, who should be liable.

- The plaintiff was a factory worker in the defendant's factory. The factory became flooded and management did everything possible to remove the effects of the flood.

However the factory floor was still slippery from the flood.

The plaintiff who was walking on the floor, fell and suffered injury. He sued the defendant in the tort of negligence.

- The plaintiff, who had only one good eye, was employed by the defendant. The defendant failed to provide goggles to the plaintiff for his work. While working, the plaintiff injured his one good eye and sued his employer.

- Two appellants were cooks employed by the respondent in the respondent's restaurant. They suffered severe burns on 13 March 2015 when an explosion occurred in the restaurant kitchen because of a defective gas cylinder.

→ Solution:

case-I, The flooded factory and slippery floor:-

- In the first case, the plaintiff a factory worker, slipped and got injured on the factory floor that was still slippery after a flood. To determine the liability, we need to assess whether the defendant, the factory owner or

management, was negligent.

- Negligence in tort law requires four elements: duty of care, breach of duty, causation and damages. The defendant owes a duty of care to maintain a reasonably safe working environment for employees. If the defendant breached this duty and it directly caused the plaintiff's injuries, the defendant may be held liable.

- In this case, the defendant took action to remove the effects of the flood, indicating that they recognized the potential danger and took steps to address it. However, the floor remained slippery, leading to the plaintiff's fall and injury. It could be argued that the defendant did not take sufficient measures to ensure the safety of the employees, such as adequately drying or providing warning signs about the slippery condition.

- To determine liability, it would be necessary to examine the specific actions taken by the defendant and assess whether they were reasonable in the circumstances. This would involve considering industry standards, local regulations and any prior incidents or warnings related to slippery floors in the workplace.

Case-II: Failure to provide goggles:-

- In the second case, the plaintiff an employee with one good eye, was not provided with goggles by the defendant, his employer. While working the plaintiff injured his one

one good eye and sued the employer for negligence.

- Employers generally have a duty of care to provide a safe working environment for their employees. This duty includes taking reasonable measures to prevent foreseeable harm. In this case, the plaintiff's employer failed to provide goggles, which could be considered a breach of the duty of care if goggles were necessary to protect the employee's eyes.

- To determine liability, it would be important to establish whether goggles were necessary for the plaintiff's work and whether it was reasonably foreseeable that the lack of goggles could lead to an eye injury. This would involve examining the nature of the plaintiff's work, industry standards and any regulations or guidelines regarding eye protection in similar work environments.

Case III: Explosion due to defective gas cylinder:

- In the third case, two cooks employed by the respondent suffered severe burns when an explosion occurred in the restaurant kitchen due to a defective gas cylinder.

The appellants sued the respondent for negligence.

- To establish negligence, the four elements mentioned earlier must be examined. The respondent owed a duty of care to provide a safe working environment, including properly maintained equipment. If respondent breached this duty and breach directly caused the appellant's injuries,

the respondent may be held liable.

- In this case, the explosion was caused by a defective gas cylinder. It could be argued that the respondent, as the employer, should have taken reasonable steps to ensure the safety of the employees by inspecting and maintaining the equipment properly. If the respondent failed to do so, it could be considered a breach of the duty of care.

- Liability would also depend on whether the respondent knew or should have known about the defective gas cylinder and whether they took appropriate actions to prevent the explosion. It would be necessary to assess the respondent's maintenance procedures, inspection records and any prior incidents or complaints related to equipment safety.

- In conclusion, determining liability in these cases would require a detailed examination of the specific circumstances including the actions or omissions of the defendants, the duty of care owed, and the foreseeability of harm. Legal principles, industry standards and prior cases would also play a crucial role in assessing liability.

Cases involving breach of NEC code of conduct:-

Q5 A recently built RCC slab of a single storied poultry plant collapsed and killed all the chickens. The farm owner blamed the labor contractor for the defective work. The contractor accused the client for providing rusty and inadequate amount of steel bars and old cement for the roof slab. The farm owner then asked for compensation from the material supplier (for inferior materials) and the consultant (for improper supervision). The material supplier claimed that the farm owner bought the cheapest rusty bar and old cement, despite warning of unsuitability for slab casting. The consultant reported that the cause of roof collapse is the use of very dirty water in mixing the concrete, which has provided by the farm owner and used by the contractor despite verbal objections from the consultant's site supervisor.

Analyze the situation carefully and decide which party (client, contractor, material supplier and consultant) is more responsible or less responsible for the roof collapse. Explain your decision with reference to the professional code of conduct of Nepal Engineering Council (NEC) and the Federal Federation of Contractors' Association of Nepal (FFCAN).

→ Solution,

Analyzing the situation, the responsibility for the roof collapse can be attributed to multiple parties based on the information provided:

a) Client (Farm owner):

The client is responsible for overall project and has certain responsibilities regarding material selection and project management. If the client knowingly purchased inadequate or substandard materials despite being warned by the material supplier about their unsuitability, they share some responsibility for the collapse. Additionally, if the client provided dirty water for mixing concrete, despite objections from the consultant's site supervisor, they also bear responsibility for compromising the quality of the construction.

According to the professional code of conduct of NEC, the client is responsible for providing accurate and complete information to the design and construction team, cooperating with the professionals, and ensuring the implementation of the project adheres to relevant standards and specifications. The client's decision to purchase inferior materials and provide dirty water for mixing concrete can be considered a violation of their responsibility.

b) Contractor:

The contractor is responsible for executing the construction work and ensuring quality workmanship. If the contractor knowingly used inadequate amounts of steel bars and old-

cement provided by the client, despite their knowledge of their unsuitability, they share responsibility for the collapse. The contractor should have rejected the inferior materials and insisted on using appropriate materials for the construction.

The FCAN has a code of conduct that emphasizes the responsibility of contractors to carry out their work diligently, adhere to relevant standards and specifications and maintain the highest standards of quality and workmanship. By using inadequate materials and not raising concerns about their unsuitability, the contractor could be seen as failing to fulfill their professional obligations.

3. Material supplier:

The material supplier claims to have warned the form owner about the unsuitability for purchased rusted bars and old cement. If this can be substantiated, the material supplier holds a lesser degree of responsibility for the collapse. Their responsibility lies in providing accurate information and guidance to the client regarding suitable materials. However, it is important for the material supplier to ensure that their communication with the client is clear and documented to support their claim of warning about unsuitability of the materials.

4. Consultant:

The consultant's responsibility lies in providing professional guidance, design supervision, and ensuring the quality of the construction work. In this case, the consultant reported that the collapse was due to the use of dirty water in mixing the concrete, despite objections from the consultant's site supervisor. The consultant's objections indicate a responsible attitude towards maintaining construction quality. However, it is crucial for the consultant to have clear documentation of the objections raised and communication with the client regarding the issue.

Both the NEC and FCAN emphasize the responsibilities of consultants to provide professional guidance, adhere to relevant codes and standards and maintain quality control. The consultant's objection to using dirty water aligns with these professional obligations.

In summary, based on the information provided and the relevant professional codes of conduct, the responsibilities for the roof collapse can be attributed as follows:-

- The client bears significant responsibility for purchasing inadequate materials and providing dirty water for mixing concrete, disregarding warnings from the material supplier and objections from the consultant's site supervisor.
- The contractor shares responsibility for using the inadequate material provided by the client and not

insisting on appropriate materials for the construction. The material supplier holds a lesser degree of responsibility, depending on their ability to provide evidence of warning the client about the unsuitability of the materials.

The consultant demonstrated responsible behavior by objecting to the use of dirty water but their role may require clearer documentation and communication.

Cases involving breach of Public Procurement Act and Public procurement Regulation:

Q6 An engineer is posted as a project manager of a new hydropower project of NEA. The first work was to excavate soil for foundation of boundary wall of planned project office area. After discussing with engineers friends from same area, he called a reliable local contractor and asked him to provide rate of earthwork excavation. Since, the rate was reasonable, a contract was signed and work started immediately. After completing first phase of work, which consisted to excavation work worth RS 1 million, the engineer measured the work, found the work to be satisfactory and a bank cheque of a 1 million was provided to the contractor. Answer the following questions

- Was everything done as per the prevailing act of Nepal?
- Were any laws of Nepal breached in the process of contract awarding and payment to the contractor?

Cases involving breach of intellectual property rights and copyrights:-

Q7 A fresh water resources engineering graduate (Engineer A) is approached by a Department of Groundwater (DoG) senior engineer. The DoG engineer asks Engineer A to conduct a district-wide study of groundwater surface water interlink in Palpa and provides a sample of report to be produced. Engineer A finds that same report is based on a superficial study, with all the data taken from USA, and requests money to visit Palpa and collect field data. The DoG engineer refuses, saying that they got the project from low bid, asks Engineer A to prepare the report based on assumed data and assures that Engineer A will not face problem since the contract to conduct the study was obtained by a consulting firm registered in DoG engineer's spouse's name, the DoG engineer himself is responsible to check the report quality, and Engineer A's name will not be in the report.

List all the options for Engineer A.

Separate the options into moral, ethical & legal categories.

Analyze each option based on ethics & risk to Engineer A.

→ Solution,

Option for Engineer A:-

- Accept the DoG engineer's request to prepare the report based on assumed data, without visiting Palpa or collecting field data.

- Insist on visiting Palpa and collecting field data, even if it means not getting paid for the extra effort and expenses.

- Refuse to work on the project under the given conditions and inform the Doh engineer about the ethical concerns regarding the superficial study, assumed data, and lack of field data collection.

Separating the options into moral, ethical and legal categories.

Moral Category

- Option 1: Accepting the request to prepare the report based on assumed data may raise moral concerns as it involves providing inaccurate information without proper investigation.

Ethical Category

- Option 1: Preparing a report based on assumed data could be considered unethical as it compromises the integrity and accuracy of the study.

- Option 2: Insisting on visiting Palpa and collecting field data aligns with ethical principles as it emphasizes the importance of thorough investigation and data collection for a reliable study.

- Option 3: Refusing to work under the given conditions and expressing ethical concerns is an ethical choice, as it upholds professional integrity and honesty.

Legal category:

- Option 1: Preparing a report based on assumed data may not have immediate legal consequences unless it leads to tangible harm or violates contractual obligations.
- Option 2: Visiting Palpa and collecting field data might not have legal implications unless it conflicts with the terms of the contract or other legal agreements.
- Option 3: Refusing to work under the given conditions does not have immediate legal implications unless it violates contractual obligations or agreements.

Analysis of each option based on ethics and risk to Engineer A.

- Option 1: Accepting the request to prepare the report based on assumed data may seem convenient, but it raises ethical concerns as it compromises the accuracy and integrity of the study. Engineer A's risk lies in being associated with an unethical practice, potentially damaging their professional reputation and credibility.

- Option 2: Insisting on visiting Palpa and collecting field data aligns with ethical principles, as it prioritizes the importance of reliable and accurate data. The risk to Engineer A lies in the possibility of not being paid for the extra effort and expenses, but it upholds professional integrity and enhances the quality of the study.

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Option 3. Refusing to work under the given conditions and expressing ethical concerns demonstrates professional integrity and honesty. Engineer A's risk lies in potential conflicts with the DDC engineer or the consulting firm responsible for the project, which could impact future opportunities or working relationships.

Considering the ethical analysis and risks involved, option 3 of refusing to work under the given conditions and expressing ethical concerns appear to be the most ethical choice for Engineer A. It upholds professional integrity and honesty.

Cases involving abuse of position and authority:-

Q8 Engineer Mohit was appointed as an engineer by District Development Committee (DDC) of Nuwakot. He was assigned an alignment survey for a proposed road connecting A VDC to B VDC. He went for alignment survey and completed his task. During survey, he used his professional skill and knowledge. After alignment survey, a group of people's Halk party (PHP) protested at DDC stating that (a) Engineer Mohit has touched his 5 Ropani's of land through proposed road alignment to increase value of his land.

(b) Engineer Mohit also included in his alignment survey

a small piece of land of Mr. Rambir because of his personal conflict with Rambir some 10 years ago. On these ground the alignment survey shall be discarded and need a survey and also need to take action against Engineer Mohit. Answer the following questions using adequate reference.

- What Ex. Mohit should have done?
- What the DDC should do?

→ solution:
In the given scenario, there are allegations against Engineer Mohit regarding the his alignment survey for a proposed road. To address the situation appropriately, let's consider the actions that Ex. Mohit should have taken, the steps DDC should follow and whether Ex. Mohit abused his position and authority.

What Ex. Mohit should have done

a) professionalism and ethical conduct:

As a professional engineer, Mohit should have conducted the alignment survey based on his expertise, adhering to professional ethics and standards. He should have ensured that his actions were unbiased and objective, solely focused on the technical aspects of the survey.

b) Avoidance of Conflicts of interest:-

To maintain professional integrity, Mohit should have avoided conflicts of interest. If there were any

personal conflicts or potential conflicts related to the survey, he should have disclosed them to the appropriate authorities and taken steps to mitigate their impact on the survey's objectivity.

c) Documentation and Transparency:-

Mohit should have maintained proper documentation of the survey process, including data, calculations and any decisions made during the alignment process. This documentation would provide transparency and evidence of his professional conduct.

What the DDC should do

a) Investigate the Allegations:

The DDC should conduct a thorough investigation into the allegations raised by the people's hak party (PHP) regarding Mohit's actions. This investigation should involve gathering evidence, interviewing relevant parties, and reviewing the documentation related to the alignment survey.

b) Impartial Review:

The DDC should engage independent experts or a committee to review the alignment survey conducted by Mohit. This review should assess the accuracy, validity and fairness of the survey, taking into account the allegations made by PHP.

c) Disciplinary Action if Necessary:-

If the investigation and impartial review substantiate the allegations against Mohit, the DDC should take appropriate disciplinary action against him. The nature and extent of the disciplinary action would depend on the severity of the misconduct and could range from warning to suspension or termination, based on the policies and regulations governing DDC employees.

Did Ex. Mohit abuse his position and authority?

Based on the provided information, it is difficult to definitively conclude whether Mohit abused his position and authority. The allegations made by PHP need to be thoroughly investigated and evidence should be collected to substantiate or refute the claims. It is essential to follow due process and give Mohit an opportunity to respond to the allegations before making a determination on whether he abused his position and authority.

In summary, Ex. Mohit should have acted professionally, maintained ethical conduct, and avoided conflicts of interest during the alignment survey. The DDC should conduct an investigation, review the survey, and take appropriate disciplinary action if the allegations are substantiated. To determine whether Ex. Mohit abused his position and authority, a thorough investigation and review of evidence are necessary.